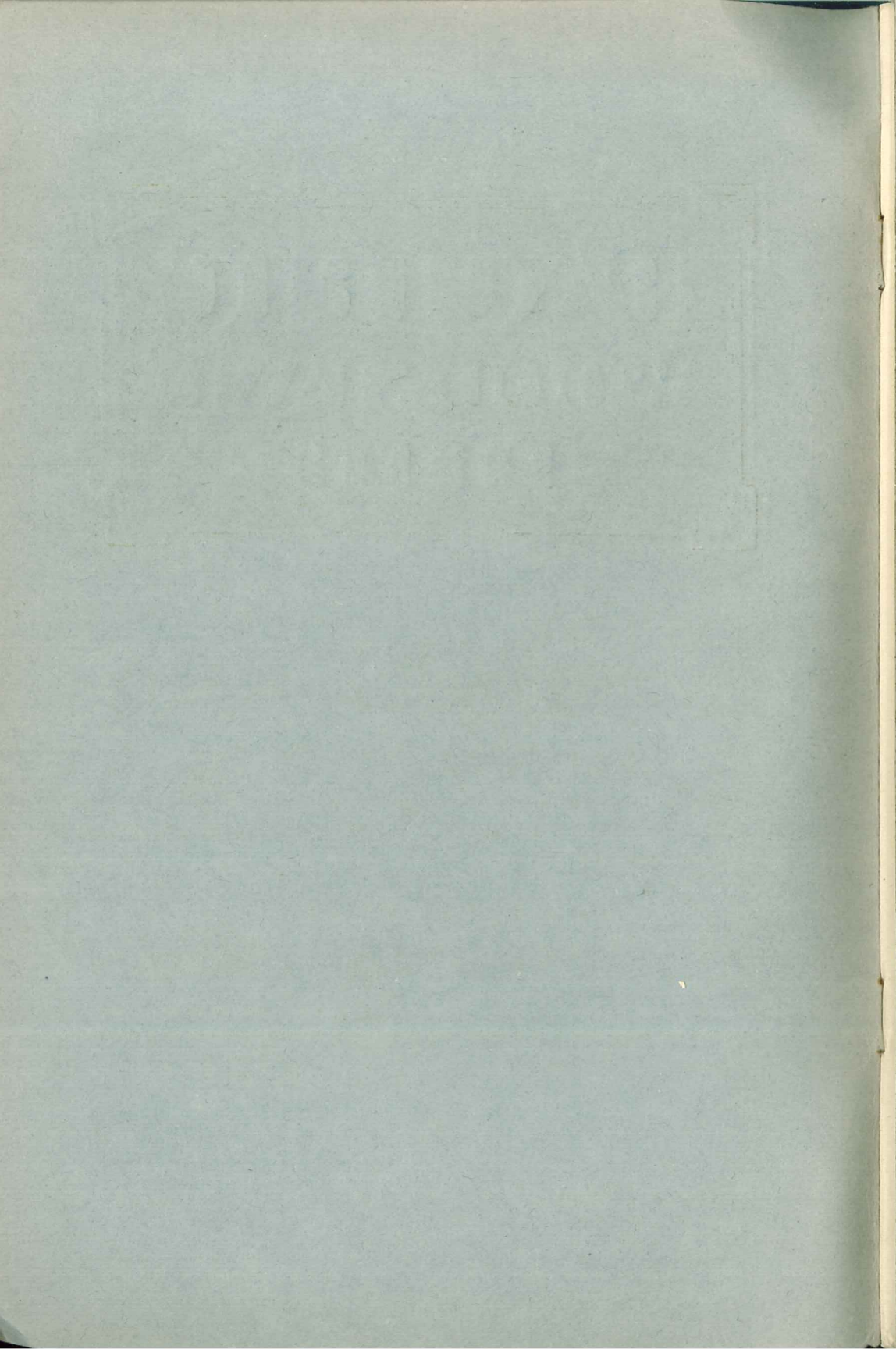




**PACIFIC  
WOOD STAVE  
PIPE**



CATALOG NUMBER SEVENTEEN.

# PACIFIC WOOD STAVE PIPE

## PACIFIC TANK & PIPE CO.

Department of  
TILDEN LUMBER & MILL CO.

GENERAL OFFICES:  
SAN FRANCISCO, CALIFORNIA

BRANCH OFFICES:

|             |                 |
|-------------|-----------------|
| NEW YORK    | SAN ANTONIO     |
| LOS ANGELES | SALT LAKE CITY  |
| DENVER      | HONOLULU, T. H. |



Cable Address: "TANKAGE"  
(San Francisco or New York)

COPYRIGHTED  
PACIFIC TANK & PIPE CO  
1926



## *F · O · R · E · W · O · R · D*

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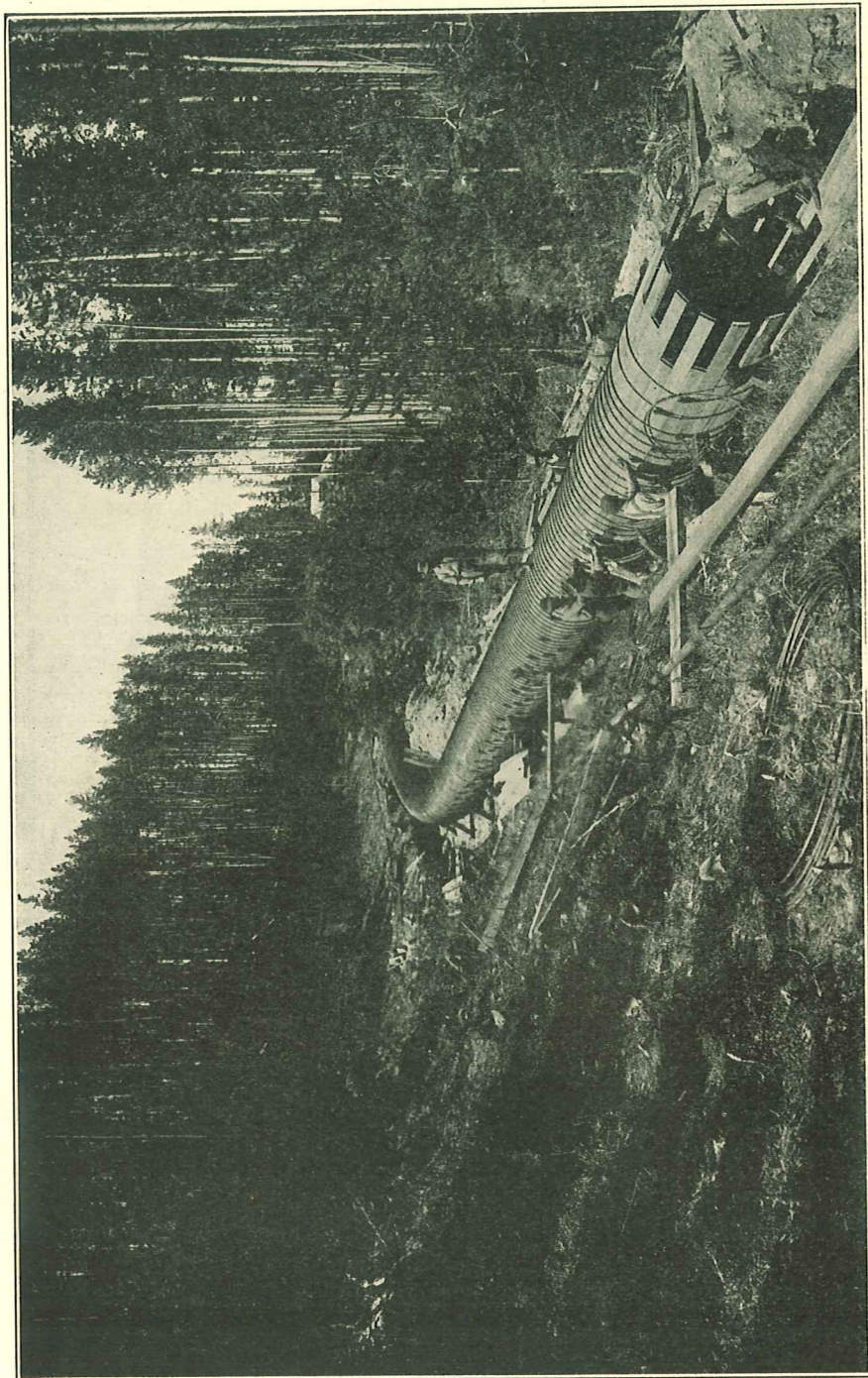
HIS CATALOGUE is the result of our study of wood pipe for the past thirty years. During that time we have been a leading factor in developing the product to its present high state of excellence. We speak, therefore, with the authority of an experience in many installations and a technical and extended consideration of what constitutes the best practice when we give herein a set of general specifications which we have adopted and which we recommend. They will be furnished you in greater detail and in more particular terms upon request.

A few of our installations are herein illustrated to enable you to visualize Pacific Wood-Stave Pipe and the various kinds of joints, fittings, valves, etc., that are used with both types; viz.: "Continuous-Stave" and "Machine-Banded."

Tables have been inserted based on formulæ resulting from a very extensive series of investigations made by the United States Government. These are conceded to be the very latest word on the subject of the flow of water through this class of pipe.

A description of several Pacific products closely allied to the manufacture of Wood-Stave Pipe will be found in the final section of this book.

Fully realizing that even in the most comprehensive catalogue cannot be solved all the problems arising from the infinite variety of conditions under which various liquids are conveyed in pipe, we will be glad to place at your disposal the technical knowledge and experience of our staff and to that end solicit your inquiries.



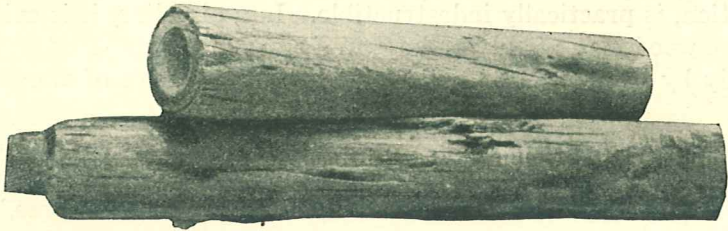
52" Redwood Pipe. Anaconda Copper Mining Co., at Georgetown Lake, Montana



## INTRODUCTION



WOOD PIPE has for centuries past been manufactured in all timbered countries. London made a large installation in 1613. The industry was brought to America by the Colonists, who used wood pipe extensively themselves, and it became an important article of export. The first public water supply system in America was installed by the City of Boston, in 1652, where wood pipe was exclusively employed.



The sections of pipe shown above are from New York's first water system, after being in the ground over 100 years. Recovered in good condition

Following is an extract from a set of resolutions drawn up at a meeting of directors of the Water Committee of New York, held on May 6, 1799:

"The Water Committee is empowered to contract for as many pine logs as they may think necessary for pipes, and also for boring the same."

Modern wood pipe is an evolution from this earlier type which served its day and generation with conspicuous success.

The demand for large supplies of water for all purposes grew with the advance of civilization, and from this ancient and antiquated form of wood pipe, augmented by numerous experiments, there evolved the present forms of Wood-Stave Pipe, in which the wood stands for durability and the steel for strength. These modern forms are known as the Continuous-Stave and Machine-Banded Pipe, and are described fully in detail later in separate sections.

Thirty years of use and actual experience with Pacific Continuous-Stave and Machine-Banded Pipe proved their value, and they now occupy a definite and stable place among standard products.



Old Water Gate  
Dug up in Park Row in 1900

### DURABILITY

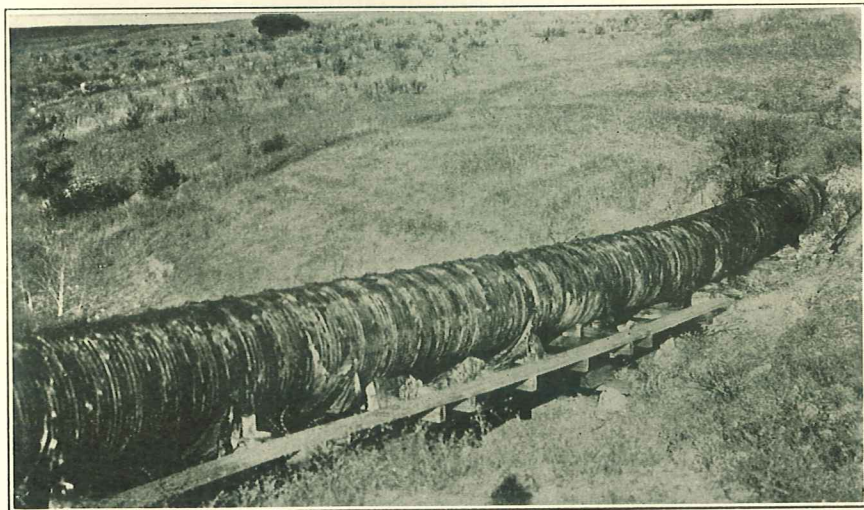
Evidences of the great durability of lumber well saturated with water are so numerous, and from such reliable sources as to establish the fact beyond the necessity of any further discussion.

Many samples of bored log water pipe have been recovered in a high state of preservation after laying in the ground more than a century. Engineers and architects have not hesitated to erect great structures on piling foundations, and the proof is cumulative that wood buried below the water table, so as to insure thorough saturation, is practically indestructible. In a pipe line, it is evident that the wood may readily be kept in a state of constant saturation, not only by capillary attraction, but by the pressure of the water itself.

In the building of Pacific Wood-Stave Pipe, great care is taken in the selection, seasoning, manufacture and inspection of the staves of which the pipe is built, and it is reasonable to assume, and experience and installations have proven that the life of these staves, when used for conveying water, will be in excess of the metal with which the pipe is banded.

The life of Pacific Wood-Stave Pipe is therefore dependent on the banding which supplies the necessary strength to hold the staves together.

In banding Pacific Wood-Stave Pipe, all conditions that might affect the life of these bands are taken into consideration. The



Section of Main Supply Line of City of San Diego—in service 30 years

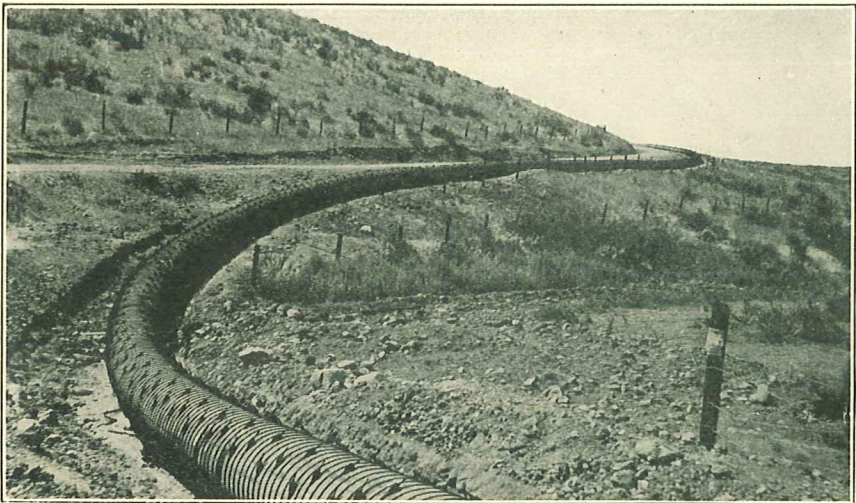


material of which the bands are composed is of the very best kind that can be obtained, and is selected with a view to long life. The pipe is banded so as to give the greatest cross section with the least surface exposed, at the lowest possible cost, care being taken to insure ample strength.

The steel banding is of a special composition, the result of many years of study and experiment, first cost not being the deciding factor in its selection. It is over-size in cross section and protected by various means, such as the highest grades of galvanized and asphalt coatings of tested preservative qualities.

A comparison of Pacific Wood-Stave Pipe with iron or steel pipe brings out the fact that in iron or steel pipe the metal has a dual function to make the pipe tight and to resist internal pressure. Both of these classes of pipe fail by pitting, and although they may be amply strong to resist far more pressure than they are designed to withstand, at the same time they may be rendered useless, owing to the fact that corrosion on both the inside and outside has pitted the metal, causing the pipe to cease being water-tight.

On the other hand, it is a well known fact that the elements which act as corrosive agents, tending to break down the material of which metal pipe is constructed, have no appreciable effect on Pacific Wood-Stave Pipe. The water flowing on the inside of Pacific Wood-Stave Pipe preserves the wood and does not come in



36" Continuous Redwood-Stave Pipe built for City of San Diego

contact with the banding, and, therefore, tends to prolong the life of the pipe, instead of shortening it; and this is true, even though the water may contain a certain amount of acids or minerals.

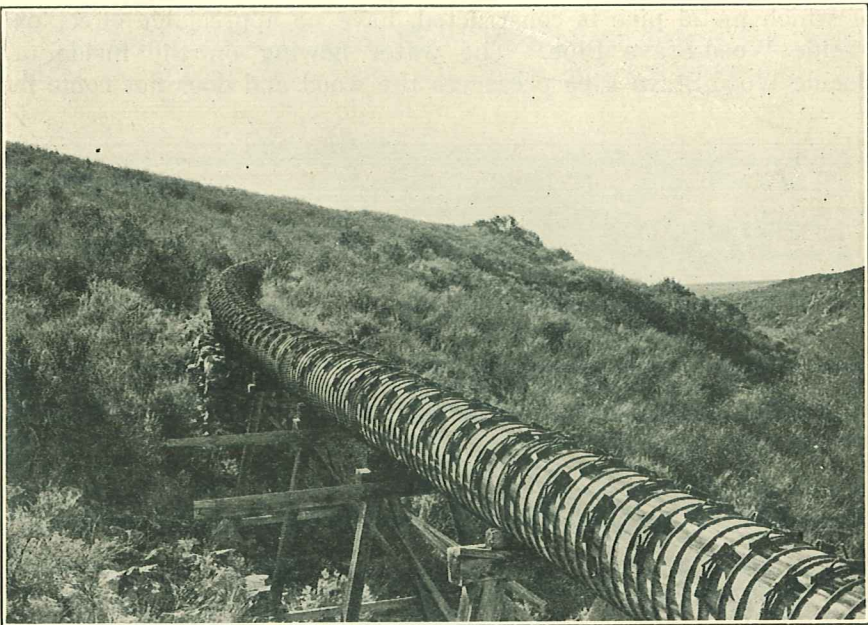
Twenty years ago we installed a distributing system for the City of Eureka, California. Recently the engineers for the State Railway Commission based their valuation on a period of 35 years' usefulness for the wood pipe, though the city contended that 50 years would be more nearly true.

The United States Government base their calculation of interest and depreciation on a life of "in excess of 25 years".

Data on Pacific Machine-Banded Wood Pipe is available since 1895, and the condition of many installations made since that time leads to the conclusion that the estimates cited are both very conservative. A list of many old installations will be mailed you on application.

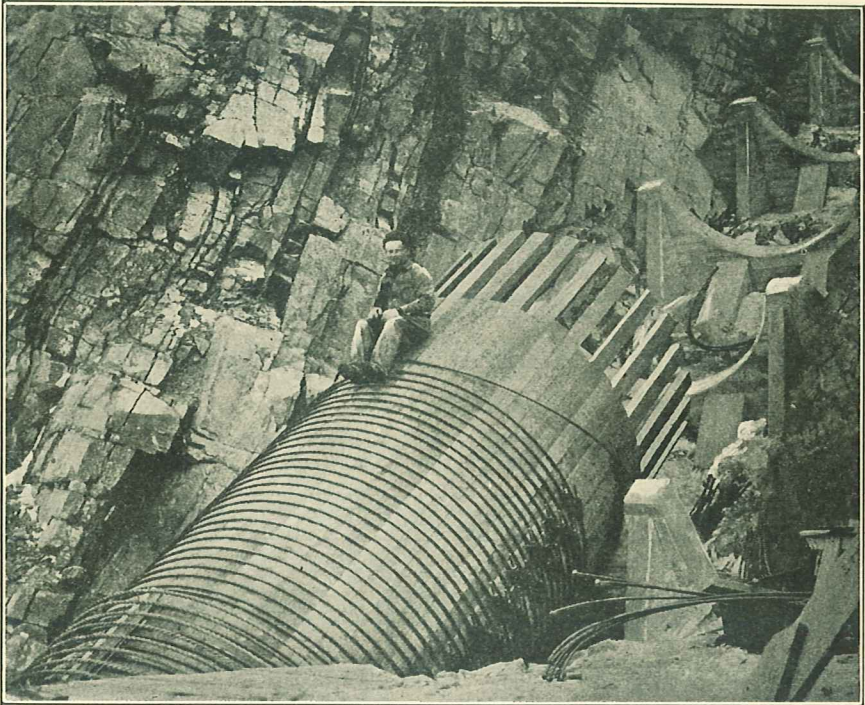
### COST

The low cost of installing and maintaining Pacific Wood-Stave Pipe is a point to consider well when investigating mediums for water conveyance.



24" Continuous Redwood-Stave Pipe, built for Cuyumaca Water Co., San Diego—  
In service 32 years





96" Continuous Redwood-Stave Pipe, built for U. S. Reclamation Service, Gilman, Montana

For low pressures it will be found very much cheaper than even the lightest forms of steel pipe, and even for higher pressures, the cost is still lower than steel pipe, and very much lower than cast iron pipe. Being light in weight, the cost of transporting, hauling and distributing, is a small item. It can be laid in a narrower trench than other forms of pipe. This feature is of material advantage when it is necessary to bury the pipe. Bell holes are not required at the joints. No lead, hemp or other materials are necessary to make water-tight joints. It can readily be laid by local labor, when directed by an expert foreman, at a much lower cost per foot than any other pipe.

The excellent quality of the materials that enter into its construction, its superior design and the low cost of maintenance, make Pacific Wood-Stave Pipe the most economical pipe manufactured.

In first cost Pacific Wood-Stave Pipe may be a little higher at times than other forms of wood pipe, but considered over a period of years, and after taking into consideration the maintenance of the pipe, it will be found economical to purchase Pacific Wood-Stave



Pipe on account of the superior quality of the materials. Therefore a long life, greater carrying capacity and low initial cost makes it economical to decide to use Pacific Wood-Stave Pipe.

### CAPACITY

It is conceded that smoothly planed timber has the lowest coefficient of friction of all materials ordinarily employed for conveying water.

Many extensive experiments have been made on the flow of water in various kinds of pipe operating under many conditions.

## UNITED STATES DEPARTMENT OF AGRICULTURE BULLETIN No. 376

Contribution from the Office of Public Roads and Rural Engineering  
LOGAN WALLER PAGE, Director

Washington, D. C.

PROFESSIONAL PAPER

November 25, 1916

## THE FLOW OF WATER IN WOOD-STAVE PIPE

By

**FRED. C. SCOBEE**, Irrigation Engineer

with discussion by

**GARDNER S. WILLIAMS**, **THERON A. NOBLE**, **D. C. HENNY**

**E. A. MORITZ**, **E. W. SCHODER**, **L. M. HOSKINS**

NOTE.—Reaffirmed and reprinted,  
October, 1925.

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Within the last few years, the United States Department of Agriculture has carried on a very extensive series of experiments on the flow of water in Wood-Stave Pipe, and attention is called to the above bulletin, and in particular to the conclusions therein:

### CONCLUSIONS

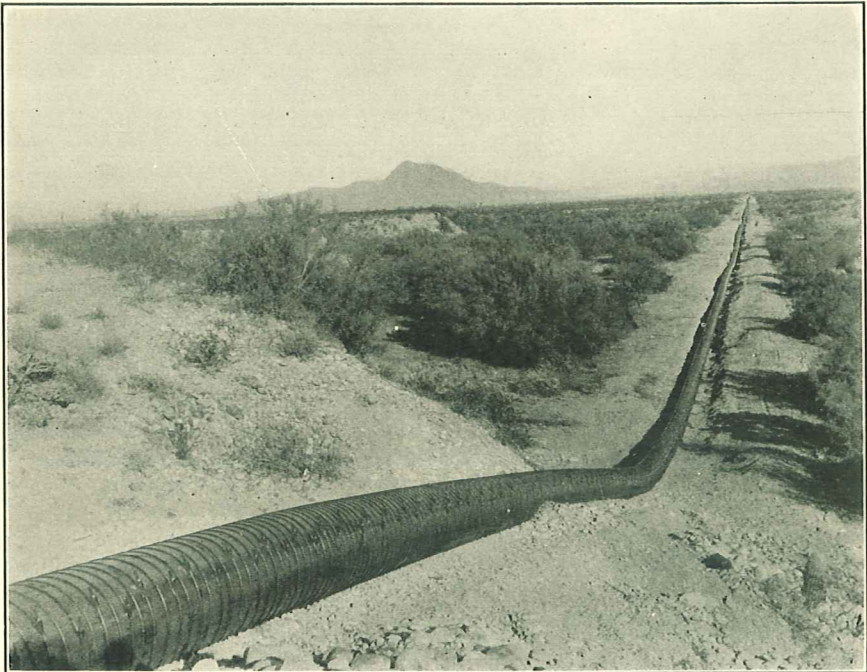
"That the data now existing does not show that the Capacity of Wood-Stave Pipe either increases or decreases with age.

"That wood pipe will convey about 15 per cent more water than a 10-year old cast iron pipe or a new riveted pipe, and about 25 per cent more than a cast iron pipe 20 years old, or a riveted pipe 10 years old."

The conclusions of the Government experiments, as given above, definitely prove that the carrying capacity of Wood-Stave Pipe is from 15 per cent to 25 per cent greater than metal pipe, with the additional advantage that Wood-Stave Pipe will remain smooth and clean internally throughout its entire life. On the other hand, similar experiments on other forms of pipe have definitely proven that the carrying capacity of practically all other forms of pipe, particularly cast iron and steel pipe, greatly decreases with age.

In the construction of Pacific Wood-Stave Pipe, great care is taken to insure staves that are milled as accurately and smoothly as the most modern machinery can make them. The joints are so constructed and carefully manufactured that when the pipe line is installed in the field, a smooth interior surface will be found, thus insuring the lowest possible friction losses.

In contrast with other forms of pipe, tubercles do not form on the interior surface of Pacific Wood-Stave Pipe, but throughout its entire life the surface remains clean and smooth, so that the capacity does not decrease. This is a marked advantage that should be taken into account in the selection of the kind of pipe to be used.



36" Pacific Continuous Redwood Pipe built for City of Phoenix, Arizona





Type of Redwood Tree from which Pacific Pipe is made

## WOOD USED

Redwood is distinctly a California wood, growing in a strip from 10 to 30 miles wide, extending from the Oregon line to Monterey Bay. It is found in no other place in the world. The larger stands of commercial Redwood are located in the Counties of Humboldt, Mendocino and Del Norte, at elevations from sea level up to 2,500 feet.

The Redwood tree is found growing to diameters up to 25 feet, and the age varies from 500 to 3000 years. The great size of the individual trees make it possible to obtain a large proportion of absolutely clear and perfect pipe, tank and silo stock. This perfection of quality as to grade, coupled with the admitted durability of Redwood, makes it ideal for these purposes.

Bulletin No. 38 of the United States Bureau of Forestry makes the following commentary as to Redwood:

"Redwood timber possesses lasting qualities scarcely equalled by any other wood. Although very light and porous, it has antiseptic properties which prevent the growth of decay-producing fungi. So far as is now known, none of the ordinary wood-rotting fungi grow in Redwood timber."

Douglas Fir is more widely distributed than Redwood, being found in great forests in the States of Washington, Oregon and Northern California. Perfectly straight trees, 8 feet in diameter, and without limbs for 150 feet of their height, are not unusual. This insures a high percentage of lumber free from knots or other defects.

Douglas Fir is comparatively light, but very strong. It is the strongest wood in the world for its weight that is obtainable in commercial sizes, and combines the qualities of great strength, light weight, ease of working and perfection of grade with that of durability.

These are the two great commercial woods of the Pacific Coast. Our other species, such as Spruce, Pine and the Cedars are of great value for many important purposes, but Douglas Fir and California Redwood, radically different as they are, each possess special characteristics of growth and structure, fitting them for use in water pipe over a great range of conditions.

We have used both Redwood and Douglas Fir for many years, and constantly maintain very large stocks of each. Our experience as to the adaptability of each species to a particular locality or purpose will be frankly stated on application.



### ADAPTABILITY

The evolution of Pacific Wood-Stave Pipe from the old bored log to the stave pipe, opened up a large new field for wood pipe. The result was not only a better conduit of small diameter, but the introduction of conduits of large diameter, not obtainable in other materials, or only at a prohibitive cost. Wood-Stave Pipe lines, eight and ten feet in diameter, are common today, and lines as large as fourteen feet in diameter, are being successfully operated.

In the following paragraphs we briefly review, under general headings, some of the services in which Pacific Wood-Stave Pipe is so successfully employed, and it will be seen that it contributes in no inconsiderable degree to the necessities and industries of a large and varied field.

### SUPPLY LINES

Practically every city, mine, manufacturing plant, irrigation system, etc., must go some distance from the site of operation to obtain a supply of water. For this purpose Pacific Wood-Stave Pipe is ideally adapted. It has been used throughout the entire United States, Mexico, Alaska, South America and many other countries for this purpose. Usually these lines are of considerable length, and its low friction losses make it the most economical class of pipe to use for this purpose. Pacific Wood-Stave Pipe is positive insurance of a permanent supply of water with a correspondingly low cost of installation and maintenance.



30" Continuous-Stave Pipe supplying water to the City of Portsmouth, Virginia

## MUNICIPAL SUPPLY AND FIRE PROTECTION

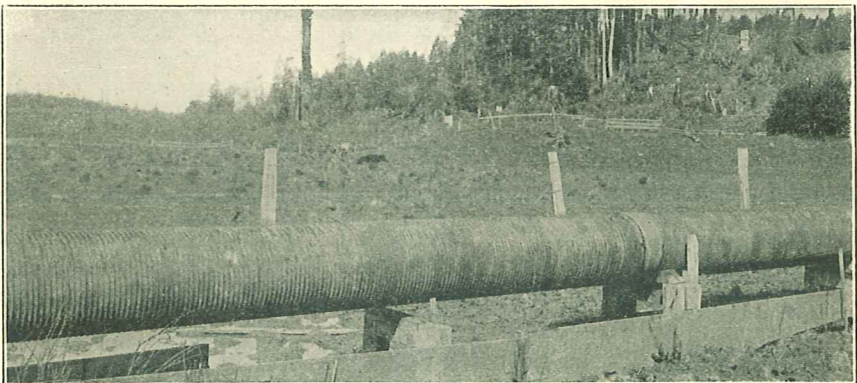
A need of protection against fire and better sanitation is constantly increasing the number of these installations, and Pacific Wood-Stave Pipe of the Machine-Banded type is more often used since diameters up to 24 inches are usually sufficient.

The use of Wood-Stave Pipe insures the coolness and purity of the water, a line of long life, small maintenance expense, a constantly maintained capacity and easily made connections, while the low cost places no serious burden on the community for a complete and modern service.

All kinds of fittings, fire hydrants, etc., for use with wood pipe are herein illustrated and always available. Where a gravity system is not possible we supply Tanks, Towers and Stand Pipes, and take charge of the entire installation from the pumping plant, if desired. Estimates, specifications and other data will gladly be furnished upon request.



16" Pacific M. B. Pipe, City of  
Evanston, Wyoming



Portion of 16" Machine-Banded Pipe, installed for Water Department, City of Eureka, California

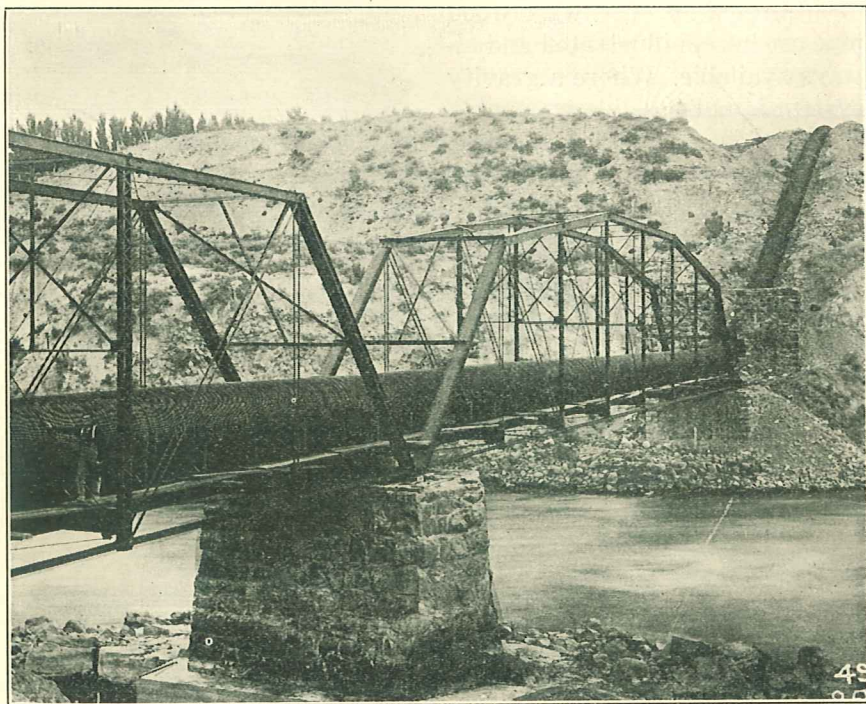


### IRRIGATION SYSTEMS

Artificial irrigation of the soil, by controlling the delivery of water, both as to time and quantity, assuring not only the maturity of full crops, but permitting a large latitude in their number and variation, has removed the hazard from production wherever practiced.

The open ditch, dangerous, costly to maintain, wasteful in evaporation and seepage, and in the acreage destroyed, has been supplanted by the modern wood-stave pipe line. Unaffected by alkalis often present, it may be buried and the soil above cultivated: all the water is delivered to the land; its capacity is not reduced by the formation of interior tubercles; its perfectly smooth bore minimizes the friction loss; a uniform grade is not essential, since it accommodates itself to road crossings and the topography of a rolling country; and the low maintenance and initial cost of both materials and installation makes the expense per acre of water actually delivered over a term of years, a guarantee of practical success.

Fittings, valves, hydrants, and inexpensive forms of outlets can readily be inserted in the pipe to effectively control the distribution.



72" Continuous Fir Stave Syphon, near Bliss, Idaho

### RECLAMATION

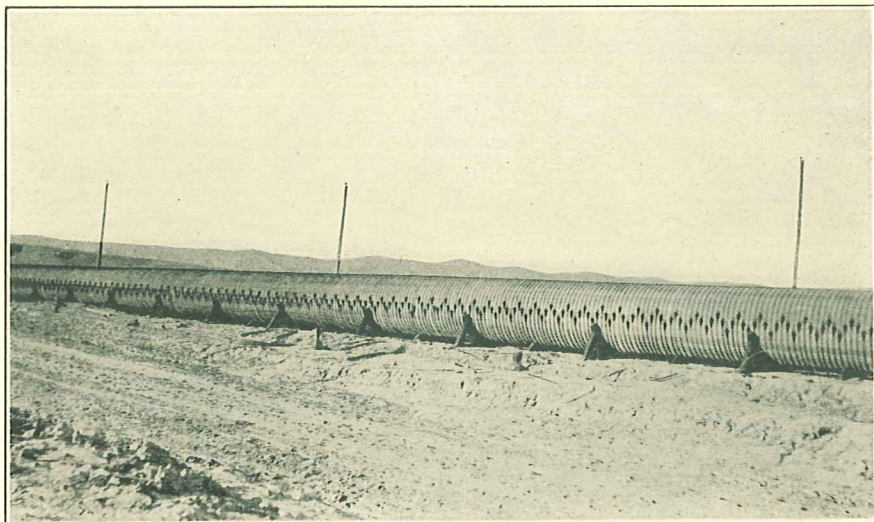
Following the enterprise of private capital, the Government itself, after a practical study of soils, rainfall, and available water supply, reached the conclusion that vast tracts of semi-arid and unproductive land could be profitably cultivated by the delivery thereon of adjacent water, hitherto a waste or a menace.

Projects of great magnitude have been undertaken, and many units are already in operation.

After probably the most thorough and unbiased investigation ever made of the subject, the Reclamation Service has employed many miles of Pacific Wood-Stave Pipe on its various projects. Anyone acquainted with this Service knows that its engineers are thoroughly familiar with what constitutes the best practice and that they insist upon receiving the best, both in workmanship and materials, on every installation.

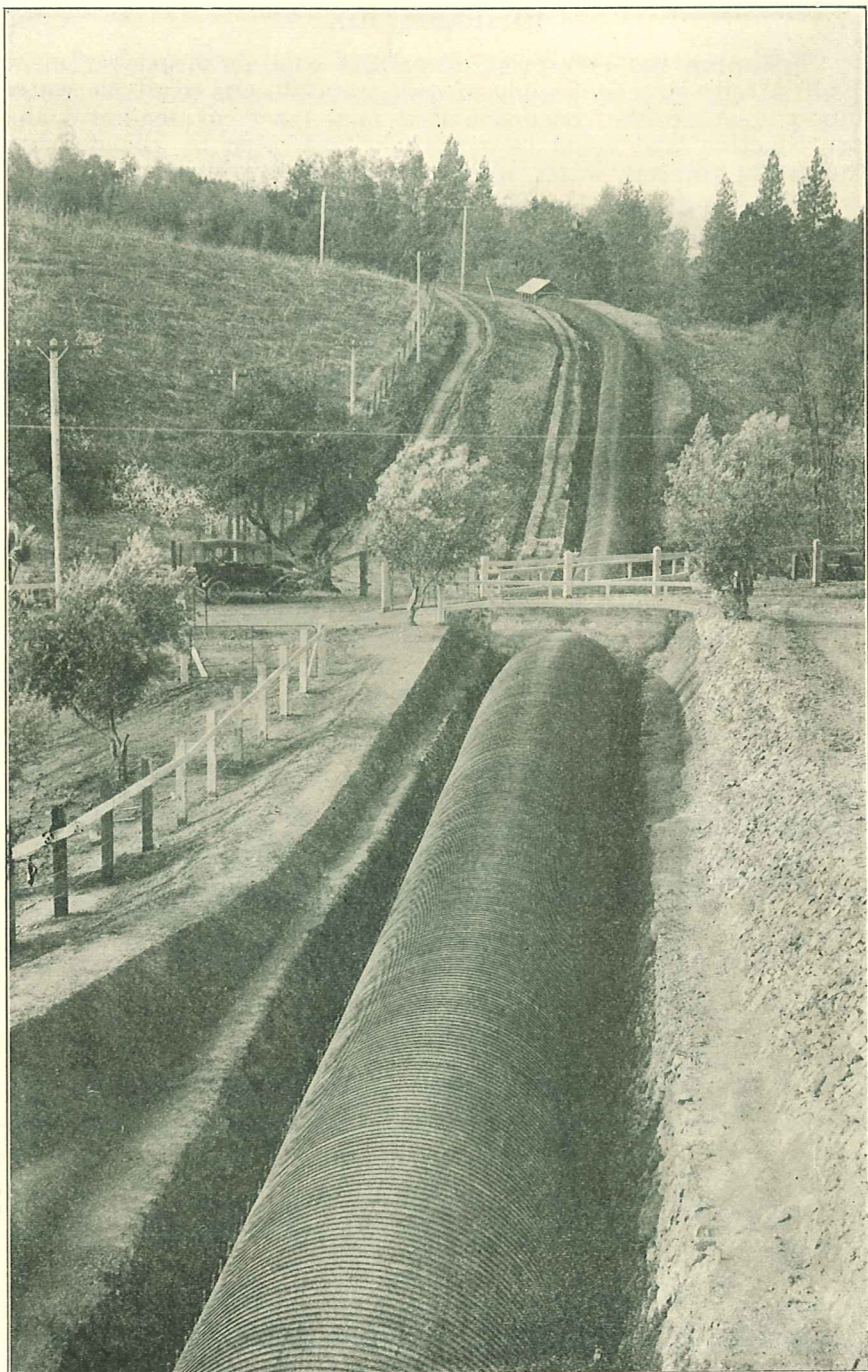
The following are some of the Reclamation Service projects on which Pacific Wood-Stave Pipe has been installed to our mutual satisfaction:

Yakima Project, Yakima, Washington;  
Flathead Project, St. Ignatius, Montana;  
Sun River Project, Fort Shaw, Montana;  
Grand Valley Project, Grand Junction, Colorado;  
Salt River Project, Phoenix, Arizona;  
Uncomphagre Project, Montrose, Colorado;  
Belle Fourche Project, Newell, South Dakota;  
North Platte Project, Mitchell, Nebraska;  
Truckee-Carson Project, Fallon, Nevada.



60" Continuous Redwood-Stave Pipe, installed for U. S. Reclamation Service at Mack, Colorado





96" Continuous Redwood-Stave Pipe, built for Pacific Gas & Electric Co., near Auburn, California

### HYDRO-ELECTRIC POWER DEVELOPMENT

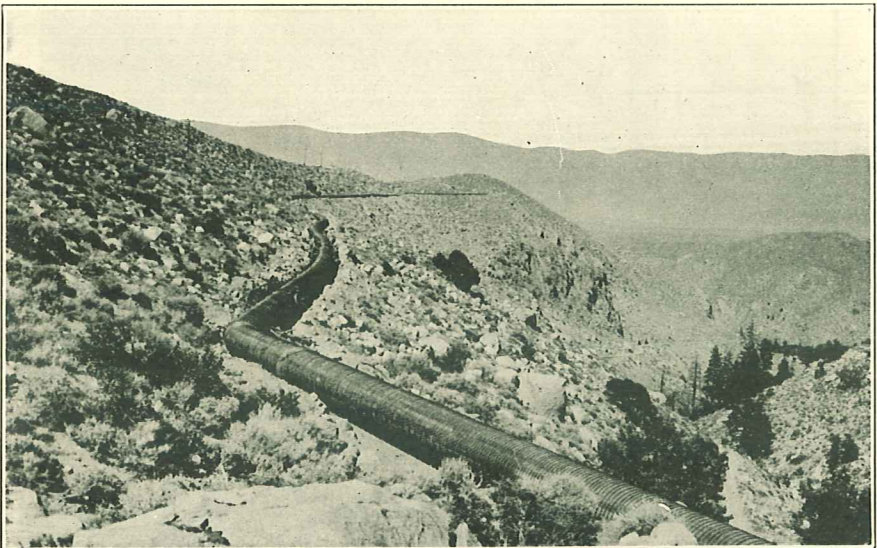
Pacific Wood-Stave Pipe is ideally adapted for conveying water to hydro-electric power plants. These plants are often located at points difficult of access, and usually large volumes of water are conveyed to generate power. For this purpose Continuous-Stave Pipe is used to advantage.

It is shipped in the knocked-down form. The various units of which the pipe is constructed are of comparatively small dimensions and weight. This greatly reduces the cost of railroad transportation, and the cost of transporting the materials from the cars to the points where the lines are to be installed. It can readily be assembled by intelligent local labor, properly supervised by capable and experienced superintendents.

Machine-Banded Pipe can also be used to advantage where small lines of pipe are desired.

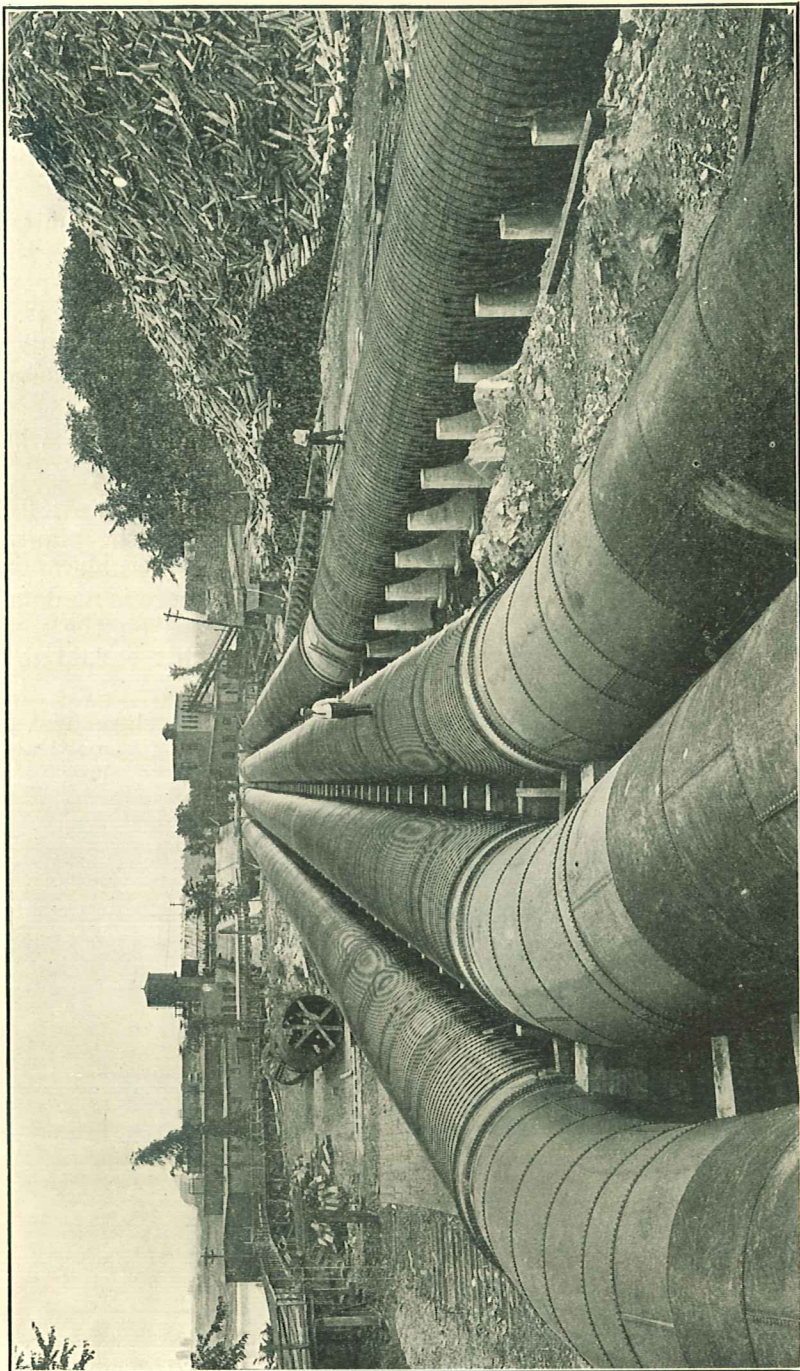
On account of its smooth interior, Pacific Wood-Stave Pipe gives the greatest efficiency in conveying water to the plant, it always being the desire to conserve all of the head possible for the generation of power. With reasonable velocities, there is no danger of the water freezing or forming ice incrustations on the inside of the pipe in extremely cold weather. It can readily be laid above the ground.

The use of Pacific Wood-Stave Pipe for this class of work commands your consideration and investigation.



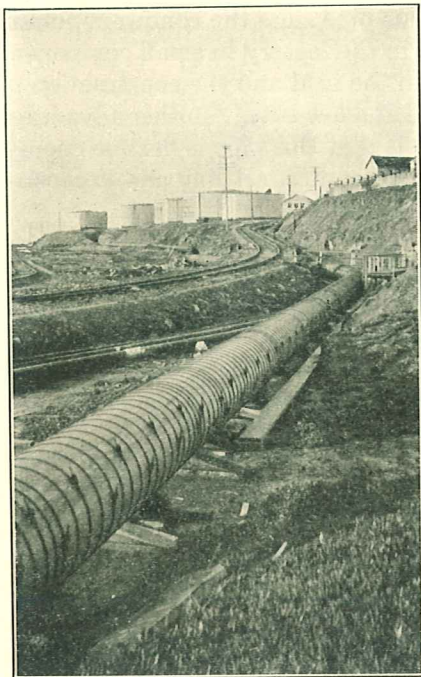
60" Continuous Redwood-Stave Pipe, built for Southern Sierras Power Co., near Bishop, Cal.





Three 120" and One 144" Continuous-Stave Pipe Installed for International Paper Co. at Orono, Maine

## SEWAGE DISPOSAL



36" Pacific Sewer Disposal—Union Oil Co.

The disposal of sewage through Pacific Wood Stave Pipe is especially practical on account of the nature of the liquids conveyed. Sewage from factories and municipalities is sometimes strongly chemically charged with either acids or alkali. The wood from which Pacific Pipe is manufactured resists the attack of these chemicals and on account of the long life thus obtained results in an economical pipe line.

The sewage from large industrial plants must sometimes be discharged directly into the sewer system at a very high temperature causing sudden temperature changes in the sewer wall. Engineers will appreciate that this sets up interior stresses in the walls of stone and metal sewers that too often result in the rapid deterioration of such lines. This condition has practically no effect on Pacific Pipe as the wood is a very poor conductor of heat and does not expand and contract with tem-

perature as do the other materials mentioned.

Outfall sewers must often be constructed to tidewater across soft



51" Pacific Creosoted Outfall Sewer for New York City, N. Y.



marshy flats where the conveying of the materials for the pipe to the site of erection is a great problem. Our pipe suits the condition admirably as all parts are accurately made in the factory in small component parts that can easily be transported in the field and the construction of such a line is readily accomplished and at a low cost. Another advantage of Pacific Pipe in such an installation is that this pipe is flexible enough so that it will withstand a reasonable amount of settling and expensive foundations are not required.

Special problems of sewage disposal are constantly arising and being solved by the use of Pacific Wood Stave Pipe. We will be glad to make suggestions on any problem of this character that is submitted to us.

### A NATIONAL EMERGENCY

In the national emergency of our entrance into the Great World War, Pacific Wood-Stave Pipe was among the first to volunteer. The Navy and War Departments of the United States called to their aid many of the best known sanitary and hydraulic engineers to design and construct camps, munition plants and other organizations to help win the war. During this period practically our entire capacity was devoted to this work, and millions of feet of Pacific Wood-Stave Pipe were shipped to various Government projects throughout the United States. The United States Government has Pacific equipment in the following:

#### Camps

Beauregard, La.  
Bowie, Tex.  
Bragg, N. C.  
Custer, Mich.  
Devens, Mass.  
Dix, N. J.  
Dodge, Ia.  
Doniphan, Okla.  
Eustis, Va.  
Funston, Kan.  
Fremont, Cal.  
Green, N. C.  
Jackson, S. C.  
Knox, Ky.  
Kearney, Cal.  
Logan, Tex.  
Lee, Va.

#### Camps

McArthur, Tex.  
McClellan, Ala.  
Mills, N. Y.  
Meade, Md.  
Normoyle, Tex.  
North Jackson, S. C.  
Pike, Ark.  
Sill, Okla.  
Sevier, S. C.  
Shelby, Miss.  
Sherman, Ohio  
Sheridan, Ala.  
Stephen Little, Ariz.  
Taylor, Ky.  
Travis, Tex.  
Upton, N. Y.  
Wheeler, Ga.

Wadsworth, S. C.

## RAILROADS

Such important lines as

Oregon Short Line,  
Atchison, Topeka & Santa Fe,  
Northwestern Pacific,  
Union Pacific,  
Western Ohio,  
Southern Pacific,  
Arizona & Eastern,  
Florida & East Coast,  
El Paso & Southwestern  
Denver & Rio Grande,  
Western Pacific,  
Los Angeles & Salt Lake,

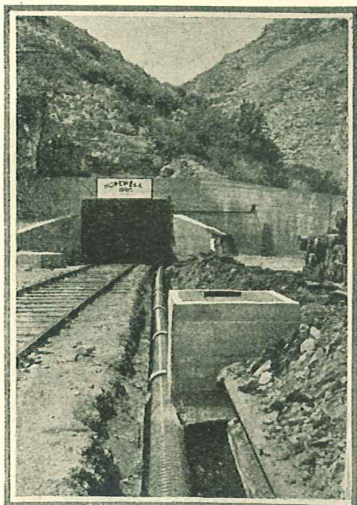
are large and satisfied users of Pacific Wood-Stave Pipe.

The engineers of some of these roads have gone into the subject in a most thorough and painstaking way and are perfectly familiar with the whole matter, both from a theoretical and practical standpoint. Having had opportunity to observe their own installations over a period of years, these men send in repeat orders for new projects or extension of their older ones, which is a good indication of the high regard in which railroad engineers hold PACIFIC WOOD-STAVE PIPE.

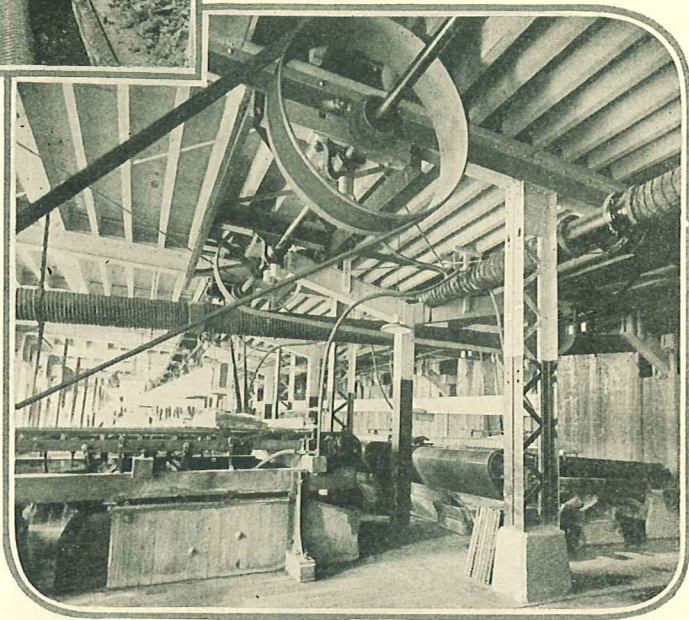


16" Continuous Redwood-Stave Pipe, built for Los Angeles and Salt Lake Railroad

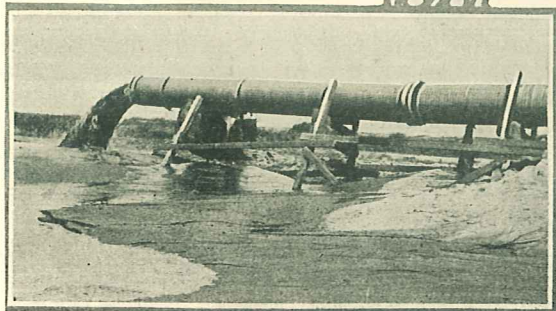




8" Wood Pipe banded with copper wire  
for conveying aciduous water; United  
Verde Copper Co., Jerome, Arizona



12" Wood Pipe  
for aciduous  
copper  
solutions;  
Arizona  
Copper Co.,  
Clifton,  
Arizona



20" Fir Dredging Pipe:  
California Debris Com-  
mission, Rio Vista, Cal.

### CONVEYING ACIDUOUS WATER FROM MINES

Practically all the large mining companies find that after going any depth below the surface, they meet with considerable water that must be pumped out of the mines. Copper mining companies often must convey chemical solutions from one part of their mill to another. For these purposes Pacific Wood-Stave Pipe is well suited. Wood or cast iron fittings can be furnished, and where conditions demand, the pipe can be banded with copper wire and bronze fittings can be supplied.

For conditions which are unusually severe on banding, we recommend for low pressure, the use of our bored pipe which we describe fully on page 67. This pipe contains no metal, and fittings and valves made entirely of wood can be furnished.

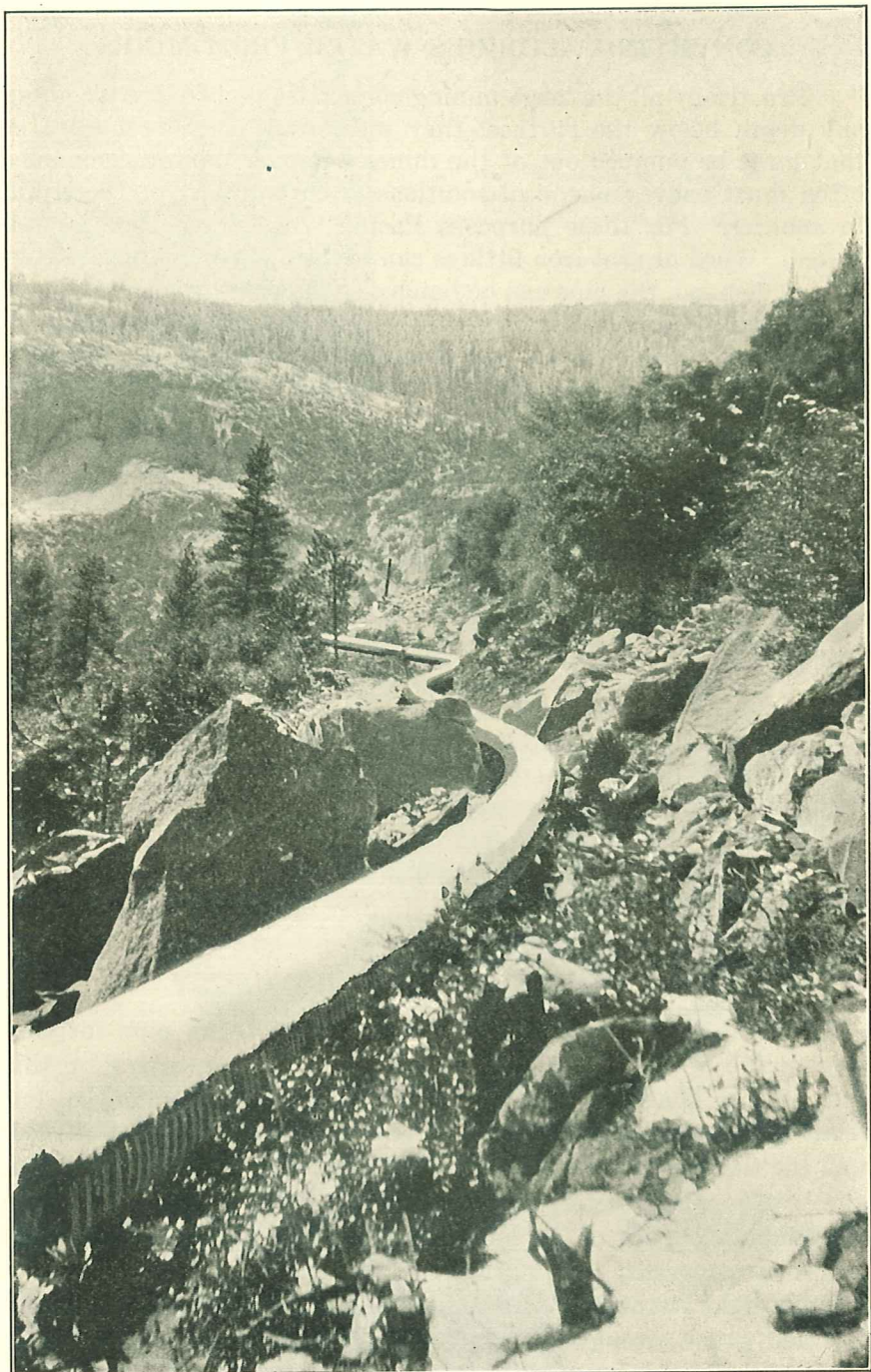
### CHEMICAL PLANTS

The manufacture of chemicals of all kinds, which were largely imported from foreign countries before the war, has developed very extensively during and since that period. Many miles of Pacific Wood-Stave Pipe have served these industries in conveying both water and chemical solutions. In the potash fields of Nebraska, and the numerous chemical plants of the East and Middle West, the soda fields of Southeastern California, the nitrate fields of Chile, Pacific Wood-Stave Pipe has given eminent satisfaction. Wood being unaffected by contact with acid or alkali, its value in the form of tanks and pipe is shared with lead in the practice of the chemical and metallurgical engineers.

### HYDRAULIC SLUICING

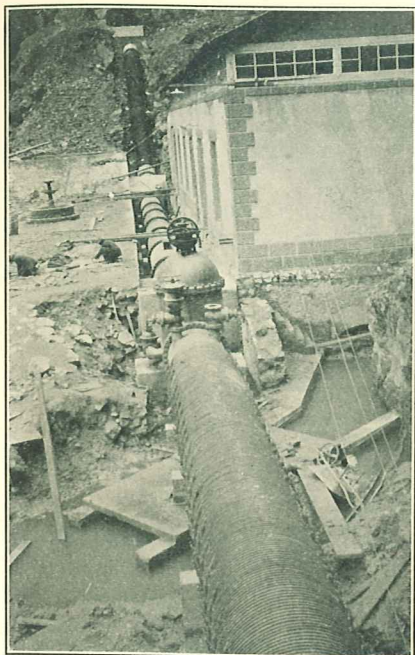
Pacific Wood-Stave Pipe appeals to those using pipe for conveying the spoils of dredging to the point of deposit. For this purpose the MACHINE-BANDED TYPE is usually employed, but provided with individually banded collars. These may be slackened, and the sections moved and re-assembled at will. As wear occurs on the bottom, the practice is to keep turning the pipe to obtain the maximum efficiency of the shell. Flexible connections are installed wherever necessary, and in the usual way, and the low pressure permits light banding; thus the cost is greatly reduced and its long life and great strength makes Pacific Wood-Stave Pipe especially attractive for this particular work.





54" Continuous Redwood-Stave Pipe, installed for U. S. Government at Yosemite National Park, California

## PACIFIC CONTINUOUS WOOD-STAVE PIPE



48" Pacific Pipe, Pateno Mines, Bolivia

This modern type of Continuous Wood-Stave Pipe is an evolution from the stave penstocks employed in the New England States and Eastern Canada between 1850 and 1870.

It is made by assembling its various units—segmental wood staves, tongues, bands and shoes—into a smooth circular tube without collars or inserted joints, and banded with individual steel bands of such size and spacing as will resist the known internal pressure.

It came into general use in the late 80's and early 90's, and these early installations are found throughout the United States today, many of them in an excellent state of preservation and giving the best of service.

Experience and tests have improved the quality of materials

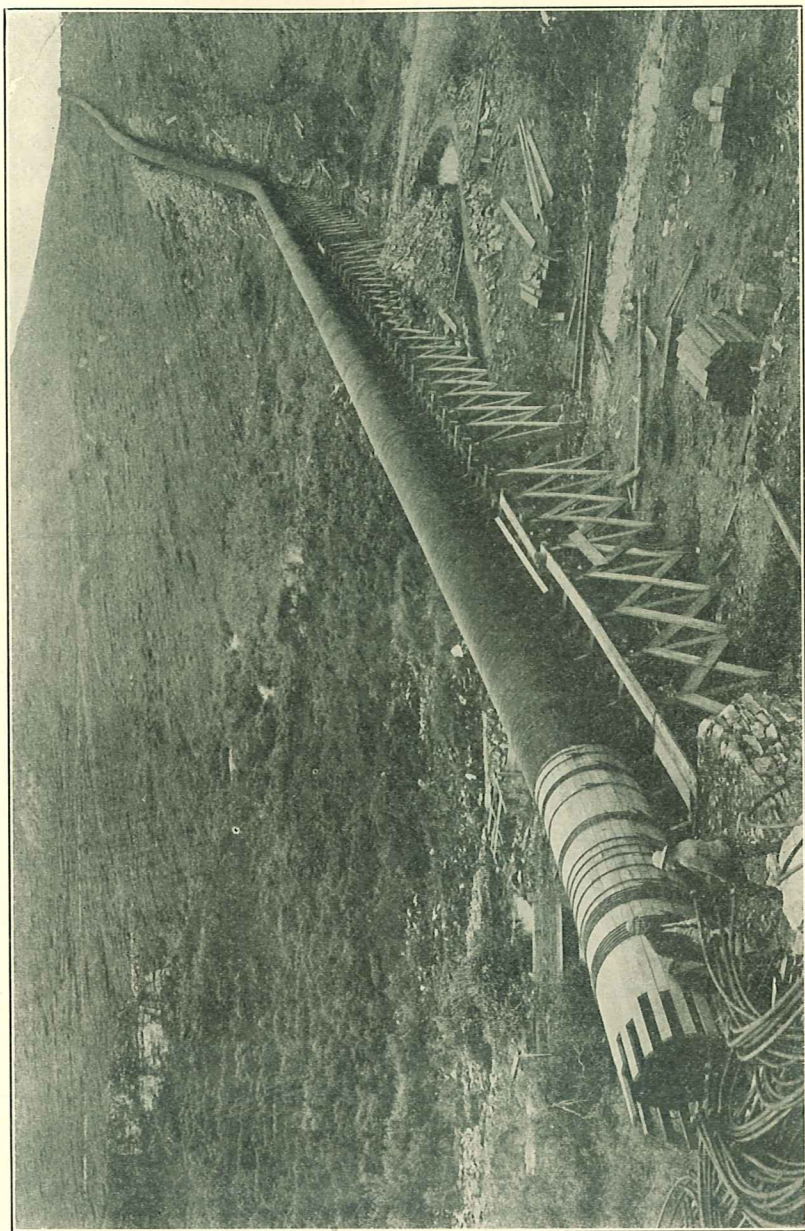
used, perfected the design and refined the manufacture of each unit so that no other form of conduit is more scientifically designed, carefully constructed or better adapted for conveying great volumes of water.

This form of pipe is always shipped in the knocked-down form, the various units being forwarded direct from points of manufacture. On arrival they are hauled and distributed conveniently along the right of way.

Our Construction Superintendents have mastered the difficulties and peculiarities of erection so that the work proceeds with accuracy and dispatch by local labor under their direction.

Detailed specifications covering Pacific Continuous Wood-Stave Pipe will be found on pages 40 to 42.





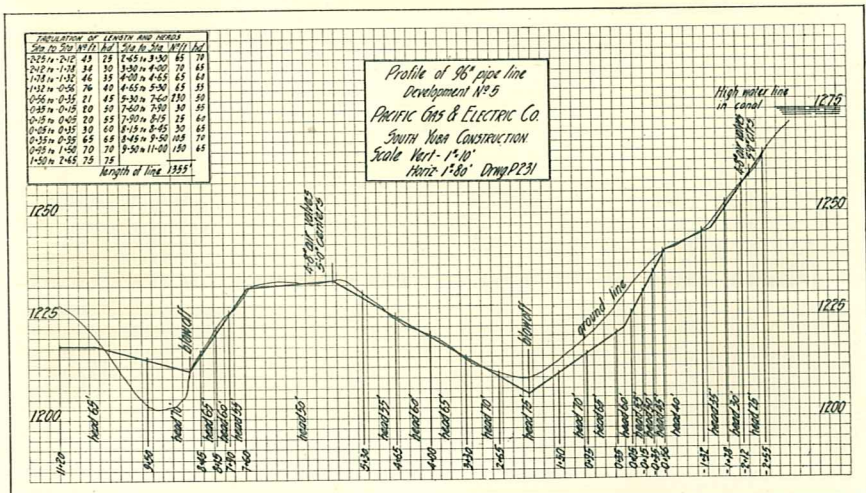
3,100 feet, 66" inside diameter, Continuous-Stave Pipe, installed for Pioneer Mining Co.  
Miocene syphon crossing Hobson Creek, Nome Precinct, Alaska

## SIZE AND PRESSURE

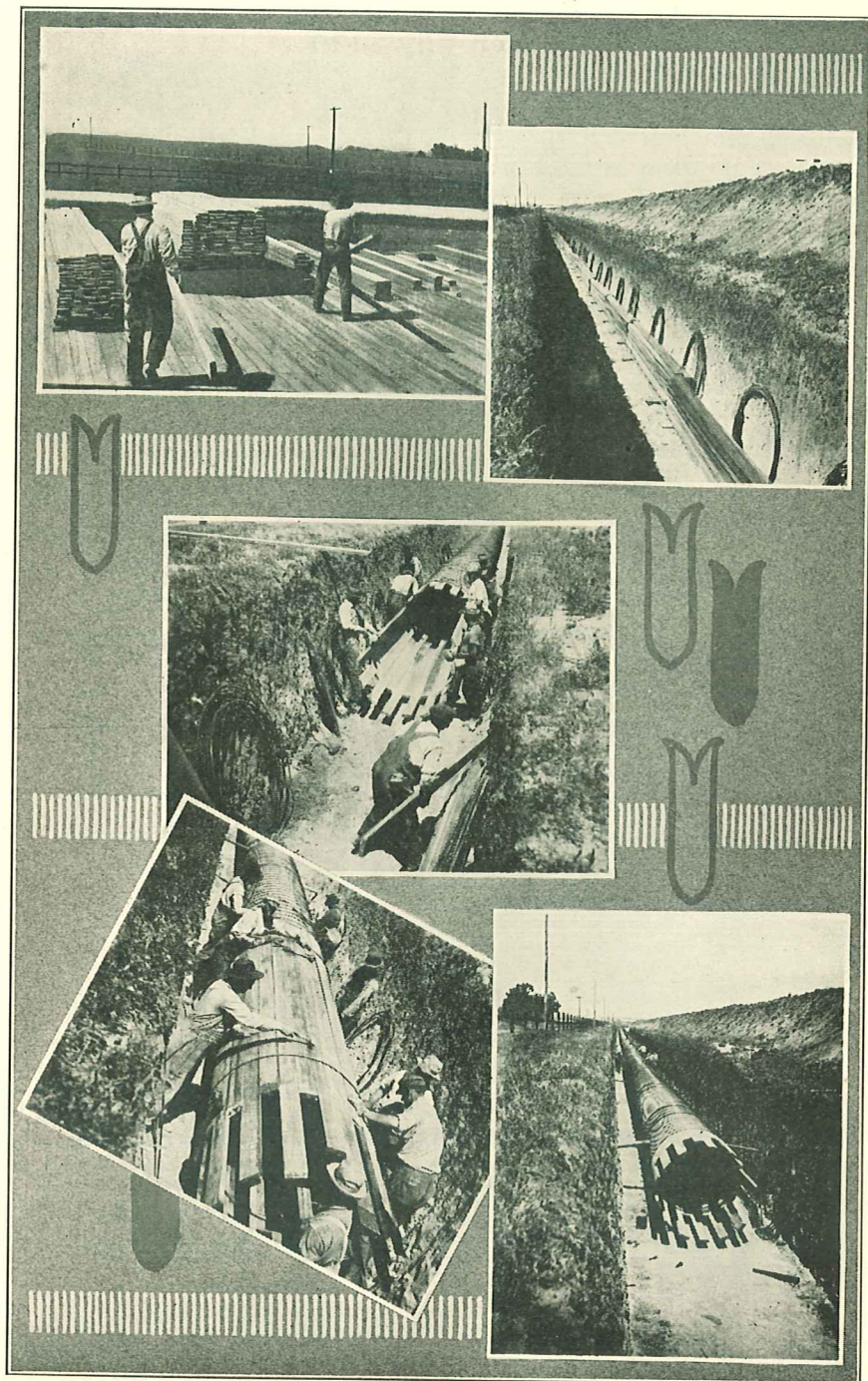
Pacific Continuous Wood-Stave Pipe is furnished in sizes of 10" inside diameter and up. The largest size of Continuous Wood-Stave Pipe built up to the present time is 14' in diameter, and this installation has proven that there is no reason why lines of larger diameter could not be successfully built, provided they are properly designed and constructed.

Pacific Continuous Wood-Stave Pipe can be furnished for pressures up to and including 400' head for the smaller diameters. The maximum pressure for which the larger diameters can be built is governed by a consideration of the size, strength and other structural features of the materials employed. Pacific Continuous Wood-Stave Pipe is built for a minimum pressure of 20' to 40' head, having a maximum spacing of the bands over the main body of the pipe so as not to exceed 10" centers. The banding is increased, due to increments of the pressure of 5' or 10', depending upon the size of the pipe.

In installing Pacific Continuous Wood-Stave Pipe which is to operate under a low head, it need only be banded for the actual pressure that it will be subjected to. Should this pressure be increased at a later date, additional bands can be placed on the pipe at a very small cost. This insures a pipe line of the lowest first cost and built of the highest grade of materials obtainable.







48" Continuous-Stave Pipe in process of construction—West Side Irrigation District, Tracy, California

## INSTALLATION

The installation of pipe lines in rough mountainous regions, low swampy sections or other almost inaccessible points, offers but little difficulty to Pacific Continuous-Stave Pipe.

The materials are all shipped in knocked-down form, and the various pieces are of comparatively small dimensions and weight. This insures the lowest possible freight rates from points of manufacture nearest to site of erection, and not the usual high rates that are assessed for completely built-up sections. In addition, standard railroad equipment can readily be loaded to minimum car-load weights. It also insures a minimum cost of unloading these materials from cars, hauling and distributing them to the site where line is to be installed. The component parts of a 10-foot or any other large diameter pipe are of such weight and size that they can readily be handled by an ordinary laborer.

The various units entering into the construction of Pacific Continuous Wood-Stave Pipe are manufactured with the greatest of care. Before being shipped from our factories, they are carefully inspected as to quality of materials and perfection of manufacture. This insures their being readily assembled into a complete pipe of the best possible construction on arrival in the field.

Skilled pipe foremen, aided by a sufficient supply of good local labor, can easily erect these materials into pipe at a minimum cost. It is not necessary to send to isolated districts a supply of skilled mechanics, who command a high wage per day, in order to install such a line, which is the case with all other classes of pipe. It is very unwise for buyers of Continuous Wood-Stave Pipe to attempt to assemble same except under the supervision of an experienced Continuous-Stave Pipe foreman.

Our policy is to contract for the delivery of all materials complete f. o. b. cars or f. a. s. steamer at the nearest point to site of installation, and to furnish all necessary labor to erect this pipe; the buyer to haul and distribute the materials, prepare the bench, dig and back-fill trench and provide structures other than pipe. We heartily recommend, and past experience has proven, that the manufacturer should be called upon to assume the responsibility for the installation of Continuous-Stave Pipe in every possible instance.

Pacific Continuous-Stave Pipe lines will be found throughout the world, and many of these installations are at points where it would have been practically impossible to install any other class of pipe on account of transportation and construction difficulties.

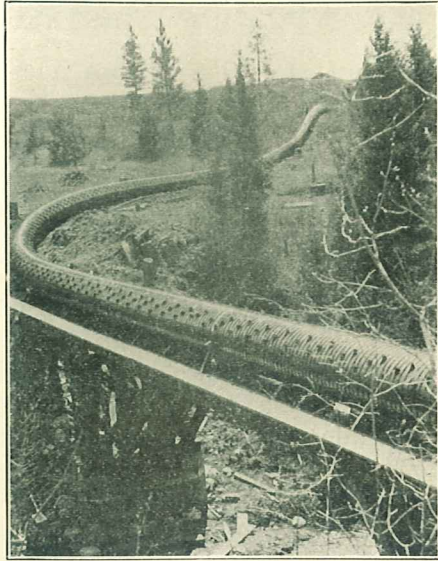


### CURVATURE

Pacific Continuous-Stave Pipe can readily be built in a rough and broken country to fit the curvature of the ground, both horizontally and vertically. Both comparatively sharp and gradual curves can be built in the pipe for a small difference in cost.

It should be borne in mind, that in designing the alignment in any Continuous-Stave Pipe line, it is impossible to establish an arbitrary rule to determine the maximum allowable curvature, and that it is always cheaper to erect pipe on a tangent. Therefore, attention is called to the fact that short and rather sharp curves with long tangents will result in a lower cost than long gradual curves and short tangents, without affecting the friction losses to any material extent. Curvature in Pacific Continuous-Stave Pipe is uniform and offers a minimum resistance to the water flowing through it.

The diameter of the pipe, the thickness of the stave, the width of the stave, the direction of the curve, whether horizontal or vertical, and the physical conditions where the pipe is to be built must be taken into consideration when determining the maximum allowable curvature. It is recommended that a combination of horizontal and vertical curves be avoided and used only when absolutely necessary.



42" Continuous Fir-Stave Pipe—U. S. Reclamation Service, Arlee, Mont.



Vertical Curve 48" Fir Line—Washington & Oregon Power Co., Walla Walla, Wash.

In the following tables we have given (1), the economical radius, and (2), the safe possible radius. (1) gives the radius of curvature in feet that is recommended for economical construction. (2) gives the minimum safe possible radius and these radii should only be used where the physical conditions are favorable toward the building of very sharp curves. Let us call your attention to the fact that these radii are based on the average conditions that are usually met in the field.

Our Engineering Department will be very glad to assist in the design of any project that you may have under consideration. We recommend that you submit preliminary plans and profiles to us for our consideration.

| DIAMETER<br>OF PIPE<br>IN INCHES | ECONOMIC RADII |       |       | FINISHED<br>THICKNESS<br>OF STAVE | MINIMUM SAFE POSSIBLE RADII |       |       |
|----------------------------------|----------------|-------|-------|-----------------------------------|-----------------------------|-------|-------|
|                                  | 1½"            | 2½"   | 3½"   |                                   | 1½"                         | 2½"   | 3½"   |
| 20                               | 84             | ..... | ..... | .....                             | 59                          | ..... | ..... |
| 22                               | 92             | ..... | ..... | .....                             | 65                          | ..... | ..... |
| 24                               | 100            | ..... | ..... | .....                             | 70                          | ..... | ..... |
| 26                               | 113            | ..... | ..... | .....                             | 76                          | ..... | ..... |
| 28                               | 117            | ..... | ..... | .....                             | 82                          | ..... | ..... |
| 30                               | 125            | ..... | ..... | .....                             | 88                          | ..... | ..... |
| 32                               | 134            | ..... | ..... | .....                             | 94                          | ..... | ..... |
| 34                               | 142            | ..... | ..... | .....                             | 100                         | ..... | ..... |
| 36                               | 150            | 225   | ..... | .....                             | 105                         | 150   | ..... |
| 38                               | 159            | 238   | ..... | .....                             | 111                         | 158   | ..... |
| 40                               | 167            | 250   | ..... | .....                             | 117                         | 167   | ..... |
| 42                               | 175            | 263   | ..... | .....                             | 123                         | 175   | ..... |
| 44                               | 184            | 275   | ..... | .....                             | 129                         | 184   | ..... |
| 46                               | 192            | 288   | ..... | .....                             | 134                         | 192   | ..... |
| 48                               | 200            | 300   | ..... | .....                             | 140                         | 200   | ..... |
| 50                               | 209            | 312   | ..... | .....                             | 146                         | 208   | ..... |
| 52                               | 217            | 325   | ..... | .....                             | 152                         | 217   | ..... |
| 54                               | 225            | 338   | ..... | .....                             | 158                         | 225   | ..... |
| 56                               | 234            | 350   | ..... | .....                             | 164                         | 233   | ..... |
| 58                               | 242            | 363   | ..... | .....                             | 170                         | 242   | ..... |
| 60                               | 250            | 375   | ..... | .....                             | 175                         | 250   | ..... |
| 66                               | .....          | 413   | ..... | .....                             | .....                       | 275   | ..... |
| 72                               | .....          | 450   | 600   | .....                             | .....                       | 300   | 450   |
| 78                               | .....          | 488   | 650   | .....                             | .....                       | 324   | 487   |
| 84                               | .....          | 525   | 700   | .....                             | .....                       | 350   | 525   |
| 90                               | .....          | 563   | 750   | .....                             | .....                       | 375   | 563   |
| 96                               | .....          | 600   | 800   | .....                             | .....                       | 400   | 600   |
| 102                              | .....          | ..... | 850   | .....                             | .....                       | ..... | 637   |
| 108                              | .....          | ..... | 900   | .....                             | .....                       | ..... | 675   |
| 114                              | .....          | ..... | 950   | .....                             | .....                       | ..... | 713   |
| 120                              | .....          | ..... | 1000  | .....                             | .....                       | ..... | 750   |
| 132                              | .....          | ..... | 1100  | .....                             | .....                       | ..... | 825   |
| 144                              | .....          | ..... | 1200  | .....                             | .....                       | ..... | 900   |





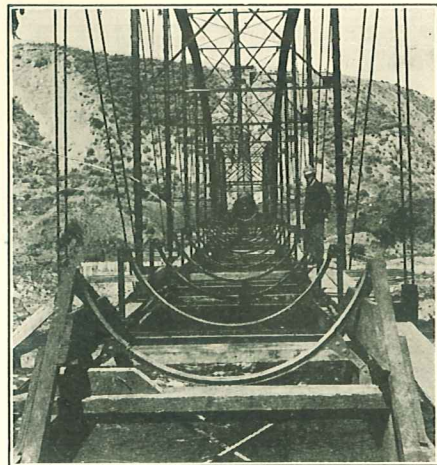
Redwood Cradles for 52" Pipe

### CRADLES

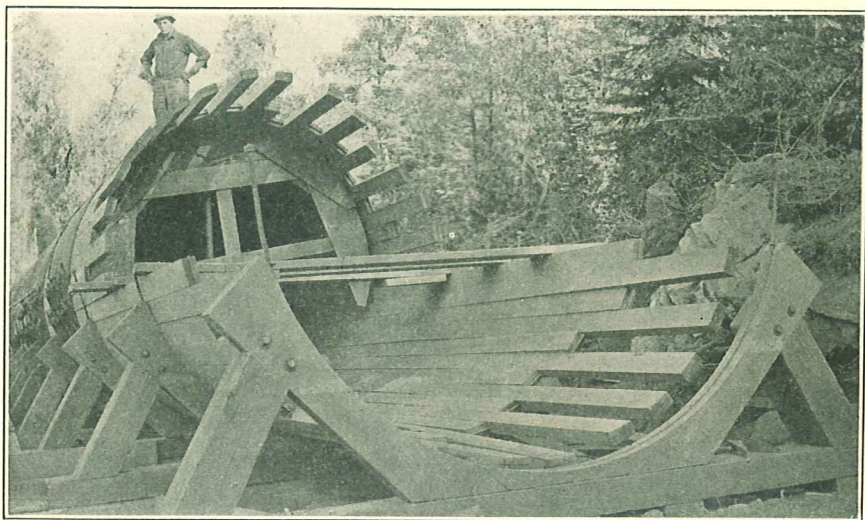
Large diameters of Pacific Continuous-Stave Pipe must be supported for at least the lower third by some form of cradle. On the larger diameters the cradles should extend to the center line. The small diameters need not be supported, but it is recommended that if the pipe is not buried then it should rest on small saddles spaced at the proper distance to prevent sagging of the pipe. This saddle will also prevent any change in the alignment of the pipe.

These cradles are usually built of wood or concrete. On bridge crossings, steel cradles are attached directly to main members of the structure or floor system. When built of wood, the selection of the lumber should be given serious consideration, so as to insure a long life. For this purpose, Redwood has proven most economical, considering both life and cost. Where the pipe is buried, selected material should be used for the back filling and carefully compacted to form a proper support to the spring line.

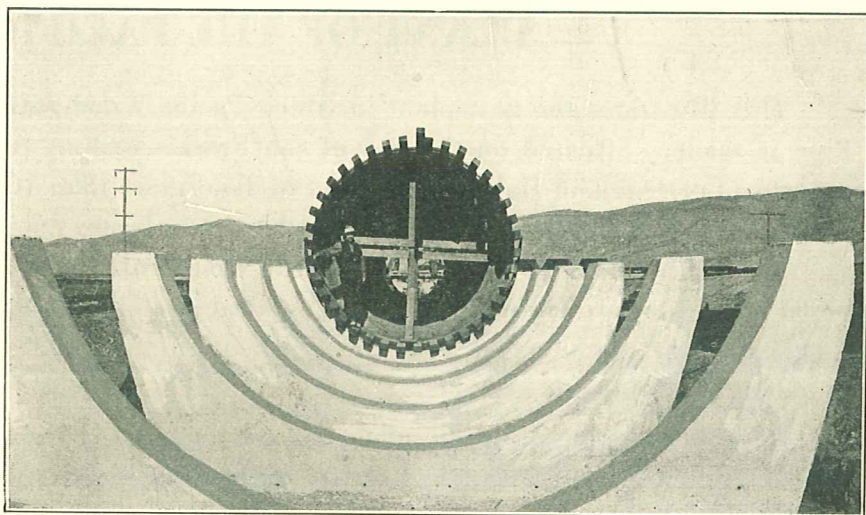
Practically every installation requires special consideration, so as to determine, first, the type of cradle which would prove the most economical, and second, which design of cradle would be best adapted for each particular installation. We have illustrated a number of typical cradles that have been used very successfully in Pacific Continuous-Stave Pipe installations, and our engineers will gladly assist you in the designing of a cradle for your proposed line upon receipt of full data.



Steel Bridge Cradles for 72" Pipe

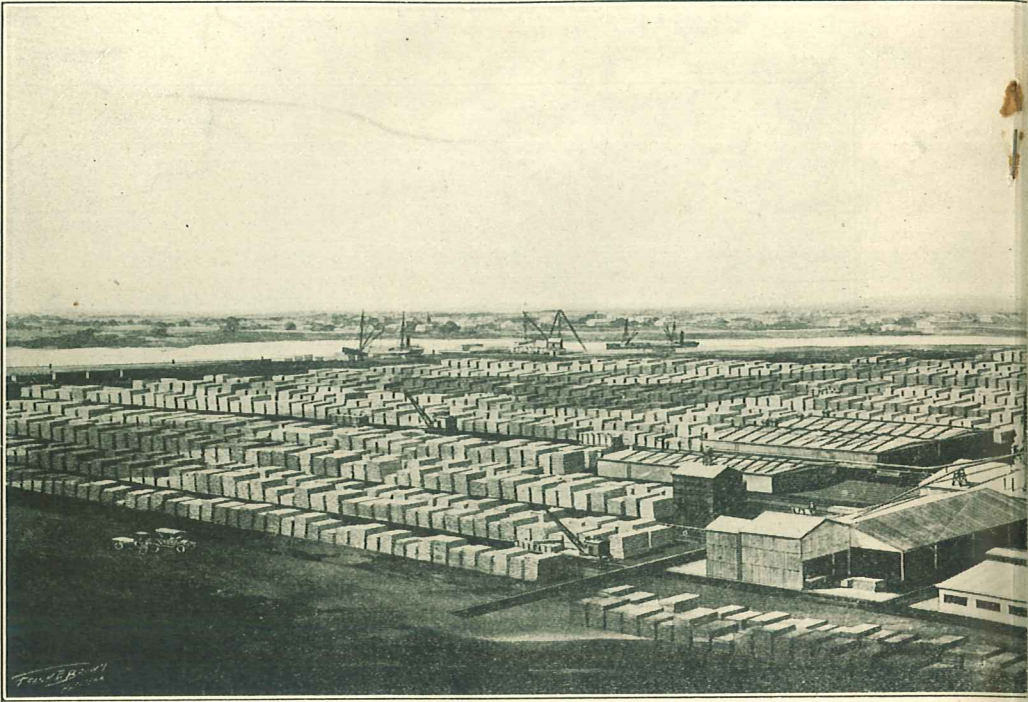


Redwood Cradles for 96" Pipe



Concrete Cradles for 11-foot Pipe

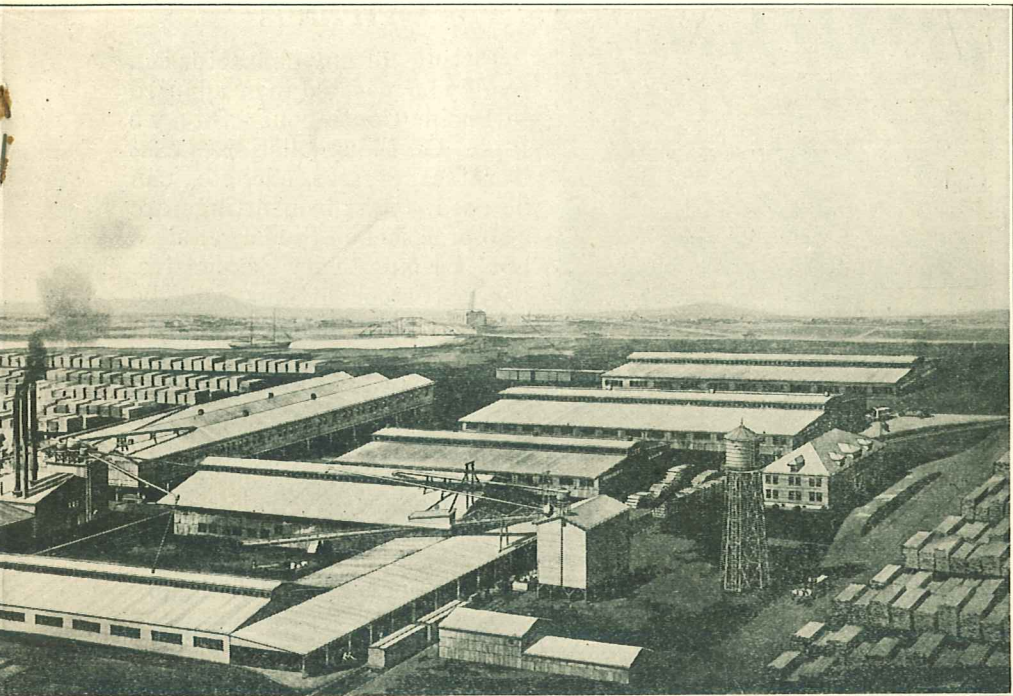




## PLANT OF THE PACIFIC

This illustrates the new plant in which Pacific Wood Stave Pipe is made. Situated on the Bay of San Francisco along the waterfront of Oakland Harbor on a tract of land more than 100 acres in extent and having more than a mile of deep water frontage in the heart of the industrial district of that locality, exceptional conditions are enjoyed for the economical assembly of raw materials, their manufacture into the finished products and its shipment to world-wide markets.

Here ocean-going ships lie afloat at our docks, discharging lumber from the northern forest ports, while three transcontinental railroads enter the plant and connect with the industrial track system serving every portion of the storage yards and factories. Carefully graded and piled an immense stock of seasoned



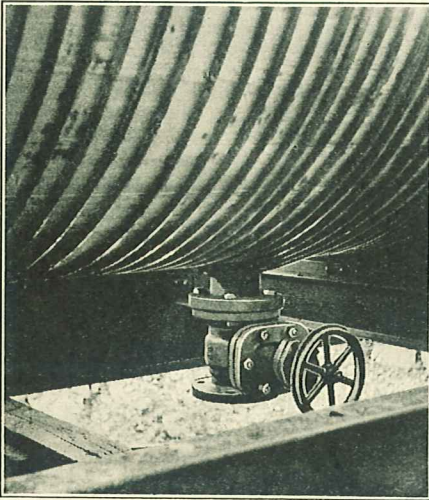
## TANK & PIPE COMPANY

lumber is at all times maintained so that no order is too large for prompt delivery.

The most modern appliances and special heavy rigid machines of great capacities and close adjustments, assure quantity production and the extreme accuracy and finished workmanship necessary to the maintenance of the high standards of excellence which has characterized the products of our plants for more than thirty-five years.

The progressive movement of all materials through their various processes of manufacture to the loading platform is a distinguishing feature of this lay-out and we have here created the most complete and modern wood-working establishment on the Pacific Coast, specialized for the production of Pacific Wood Stave Pipe and Tanks.





8" Blowoff on 72" line

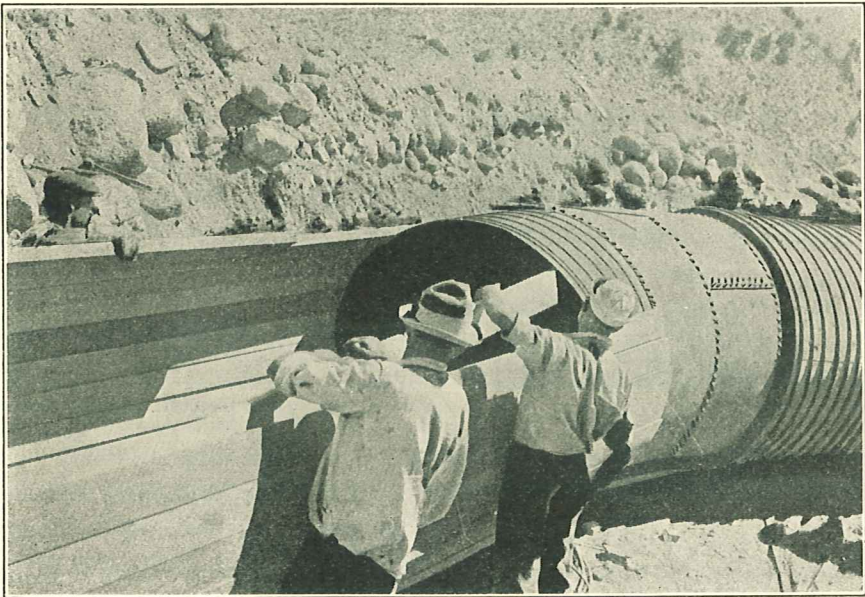
### FITTINGS

Fittings of any character can readily be inserted in or adapted to Pacific Continuous - Stave Pipe. On the smaller sizes cast iron tees, crosses, ells, etc., can be used. Cast iron fittings are also practical on the larger sizes but become very expensive. Riveted steel fittings will be found very much cheaper in price than cast iron fittings, particularly for the larger sizes of pipe. Steel fittings should be coated with asphaltum so as to insure a reasonably long life. Under comparatively low pressures, concrete fittings may be

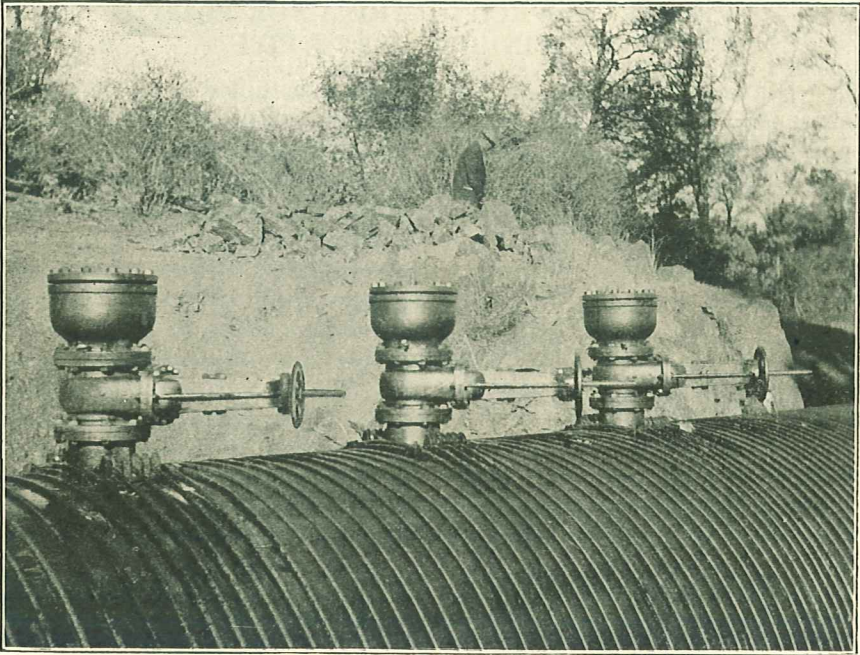
used on the larger sizes of pipe to advantage, making a considerable saving in the cost when compared with steel or cast iron fittings.

Connections between Pacific Continuous-Stave Pipe and steel or cast iron pipe can readily be made. This class of pipe can also be connected very readily to concrete pipe or any other concrete structure.

Further information will gladly be furnished upon request.



Steel Elbow on 60" line



Cluster 8" Air Valves on 96" line

### AIR VALVES

It is always essential to safeguard the successful operation of a pipe line by placing proper air valves on any summits in the line. These air valves allow the air to escape or to enter at the time of filling and emptying the line. Air valves automatically permit the air to enter the pipe when emptying, thus preventing a vacuum or partial vacuum and the possibility of collapse, which is particularly to be guarded against in lines of large diameter. They also permit the escape of air from the line while it is being filled. Where lines are of large diameters, clusters of small valves may be used in place of a large single valve, to avoid unnecessary expense. Where the head is comparatively low, it is advisable to use some form of standpipe rather than an air valve to more readily allow the air to enter and escape. Where the water contains a certain amount of air, it is necessary to place air relief valves at summits, so as to permit this air to escape under pressure. The capacity of a pipe line is very often materially cut down, due to air pockets at summits in the pipe line, where air accumulates, due to the fact that it is being carried by the water.

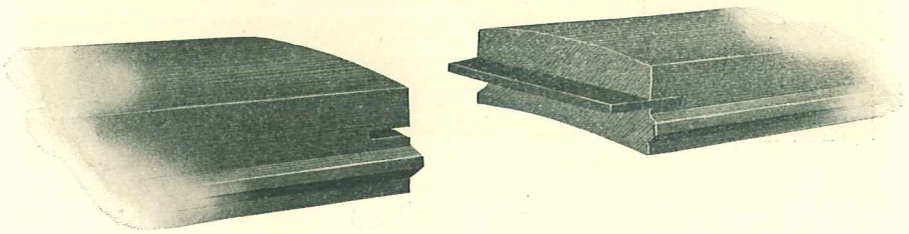
We are prepared to furnish prices on air valves of any size complete with all necessary equipment to attach them to the pipe, and such prices will gladly be furnished upon request.



### GENERAL SPECIFICATIONS FOR PACIFIC CONTINUOUS-STAVE PIPE

**Staves (Redwood).**—The staves shall be milled from clear, well-seasoned Redwood lumber (either air dried or kiln dried at purchaser's option) and shall be free from sap, knots (except small knots appearing on one face only), wind shakes, checks, dry rot, pitch pockets or any other defects that may impair their strength or durability for the purpose intended.

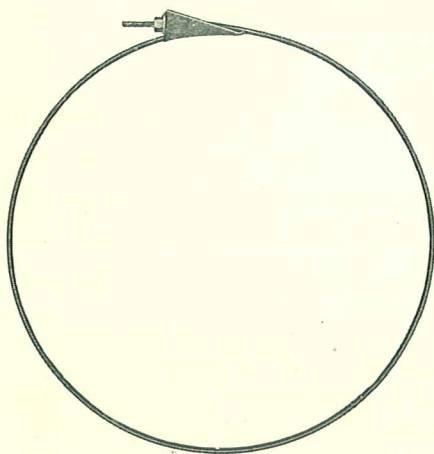
The staves shall be milled to the circular outline of the pipe, both inside and outside, and the edges shall be milled to radial lines. They shall be furnished in random lengths of from 8 to 20 feet, with an average length of not less than 13 feet. Stave ends shall be cut off square and provided with a kerf to accurately fit the wood or steel tongues to be used. These kerfs shall be in the same relative position for all staves and slotted so as to make a snug fit with the steel tongue to be used.



**Staves (Fir).**—The staves shall be milled from clear straight-grained kiln dried or thoroughly air dried Douglas Fir, and shall be free from checks, dry rot, large or unsound knots. Small sound tight knots and small pitch pockets, not extending through the stave, shall be allowed. Bright sap appearing on the inside of the stave, and not extending more than half way through the piece shall be allowed. Edges shall be practically clear or contain no defects that will prevent a water-tight joint when milled.

The staves shall be milled to the circular outline of pipe, both inside and outside, and the edges shall be milled to radial lines. They shall be furnished in random lengths, from 8 to 32 feet, with an average length of not less than 15 feet. Stave ends shall be cut off square and provided with a kerf to accurately fit the wood or steel tongues to be used. These kerfs shall be in the same relative position for all staves and slotted so as to make a snug fit with the steel tongue to be used.

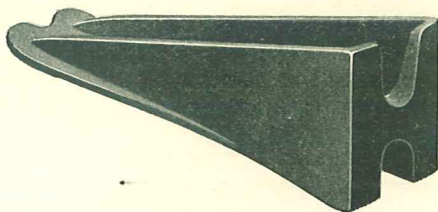
**Note.**—For the smaller diameters, tongue and grooved staves should be specified to assist in rounding out pipe. For the larger diameters, either can be furnished as desired.



**Tongues.**—The ends of the stave shall be connected by steel tongues cut from flat rolled steel (usually  $\frac{1}{8}$ " x  $1\frac{1}{2}$ ") to proper length, so that when the pipe is erected and cinched, the tongues shall project into the adjoining staves, making a water-tight joint. This projection shall be  $\frac{1}{16}$ " in all directions.

**Bands.**—The pipe shall be banded with round mild steel bands made by either the "Open Hearth" or the "Bessemer" process, and shall have a tensile

strength of from 58,000 to 65,000 pounds per square inch of cross section, an elastic limit of not less than one-half the ultimate strength and an elongation of approximately 23% in 8". The bands shall be capable of bending 180 degrees around a diameter equal to the diameter of the rod without showing signs of fracture. For diameters up to and including 58", bands shall be furnished in one piece. For 60" diameters and larger, bands shall be furnished in two pieces. Single-piece bands shall have a standard button head on one end and 6" of cold rolled upset thread on the other end. Two-piece bands shall have a standard button head on each end for one section, and 6" of cold rolled upset thread with hexagon nut and cut washer on each end for the second section. The head, thread, nut and washer shall be of such dimensions as to safely withstand all stresses brought upon them, and shall be of greater strength than that required for the band. (These bands shall vary in size from  $\frac{3}{8}$ " to 1", depending on the size and pressure of the pipe.) The bands shall be spaced so that the stress in the band, due to the pressure on the inside of the pipe, shall not exceed 15,000 pounds, based on an ultimate strength of 60,000 pounds per square inch (factor of safety of 4).

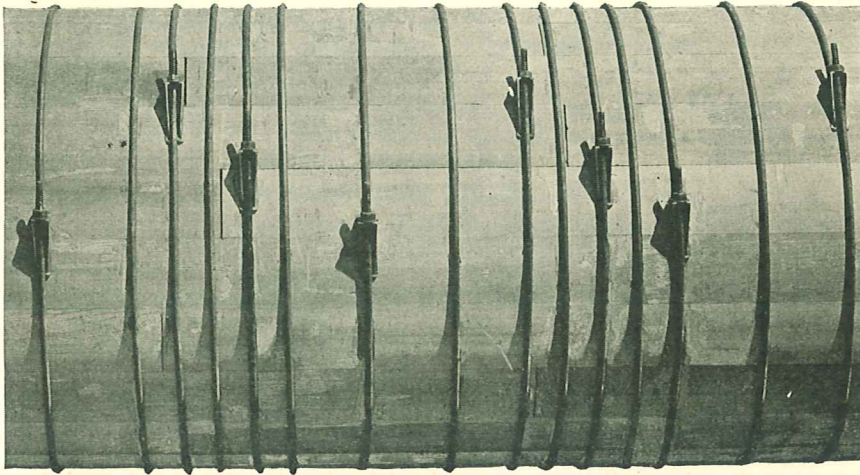


**Note.**—In determining pressures, allowance should be made for water-hammer, surge, etc.



**Shoes**—Shoes shall be of the Allen type, made from the best grade of malleable iron, free from flaws, blow-holes or other defects, and shall have a tensile strength of approximately 40,000 pounds per square inch. The shoes shall fit closely to the outside curvature of the pipe, and shall be stronger than the band which they connect.

**Coating**.—Before the bands are shipped from the factory, they shall be bent to circle, and the bands and shoes shall be dipped in a preservative asphalt preparation.



36" Pipe showing extra bands at butt joints

**Butt Joints**.—It is recommended that the maximum spacing of the bands over the main body of the pipe shall not exceed 10" centers except in very special cases. It is also recommended that the maximum spacing of the bands over the butt joints shall not exceed 6" centers.

When sections of pipe lines designed for low heads are subject to water hammer or surge we make especial provision at the butt joints by reducing the spacing of the bands. In such instances the specifications may require the spacing of bands at the butt joints to be not more than four inches. Many years of experience has shown this construction, although slightly more expensive, to be economical in the long run.

All Pacific Continuous-Stave Pipe is provided with extra bands for the butt joints.

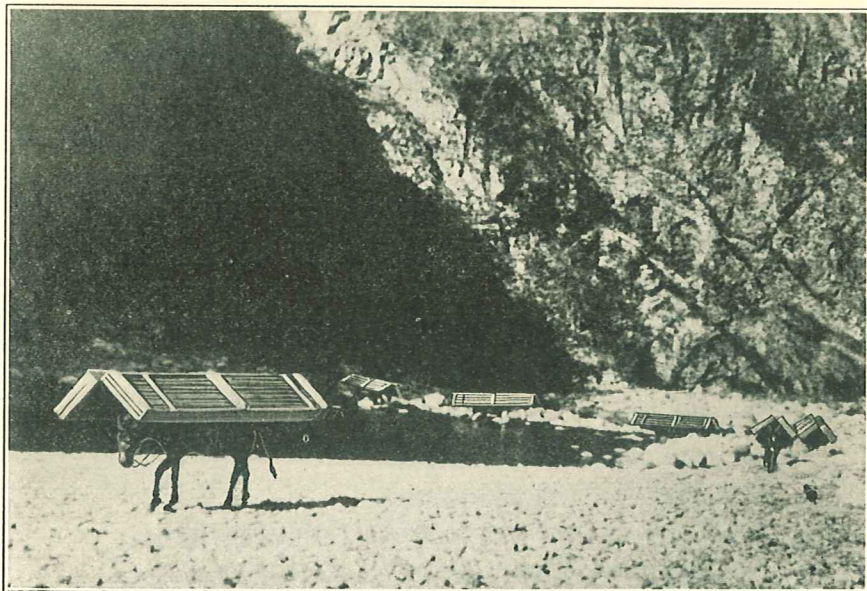
## EXPORT

Pacific Continuous-Stave Pipe is particularly well adapted for export. It is shipped in knocked-down form, assuring the materials being transported at the lowest possible rates, and not on a measurement basis, as would be the case for iron or steel pipe. Here again the ease with which it can be assembled, and the fact that intelligent native labor properly supervised by one of our expert superintendents, make it the ideal pipe for shipment to foreign countries.

In tropical countries, or those where the white ant is present, Pacific Continuous Redwood-Stave Pipe will be found capable of withstanding the hot moist climate and is immune to the ravages of the white ant.

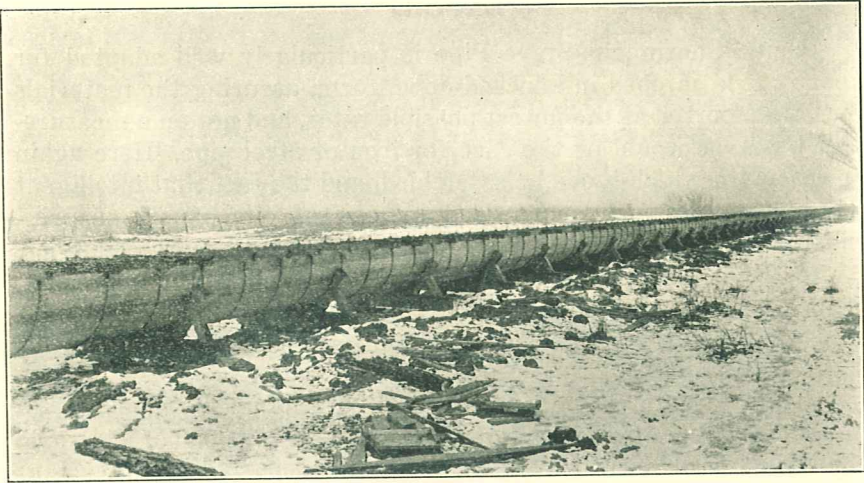
Complete data on this subject will be sent upon request.

The accompanying cut shows a portion of 16,000 feet of Pacific Continuous Redwood-Stave Pipe being transported by mules in Mexico. These materials were shipped by rail to the docks of the Pacific Mail Steamship Company at San Francisco, delivered by their steamers to Mazatlan, reloaded on cars and hauled 40 miles to Dimas, and there transported by mule back 175 miles over rough mountainous trails to site of installation. No completely fabricated pipe could have been transported to this point. Pacific Continuous-Stave Pipe was the most economical that could be installed under these severe conditions.



Pacific Redwood Continuous-Stave Pipe being transported by muleback in Mexico





### SEMI-CIRCULAR CONTINUOUS-STAVE FLUMES

Pacific Semi-Circular Continuous-Stave Flumes have many advantages over other types of flume construction. Being built of smoothly surfaced lumber, they have the lowest coefficient of friction and, therefore, the greatest capacity when compared with metal or rough lumber flumes. In addition, the capacity does not decrease with age, but remains constant throughout its life.

Owing to its rigid construction, there is no sagging between supports, and a uniform cross section and perfect alignment is always maintained. If left empty for a period of time, it can readily be kept water-tight by tightening the bands occasionally.

Here again the same high standard of materials that are used in Pacific Continuous-Stave Pipe is maintained, the specifications for the component parts of flumes being similar to those of pipe. This insures durability, and our designs economy in construction.

We are prepared to furnish Pacific Semi-Circular Continuous-Stave Flumes erected in place, built of Redwood or Fir, the latter either creosoted or untreated.

In order to prepare estimates and to quote prices to advantage, the following information is essential:

1. Size and length of Flume.
2. Grade per 100 feet or mile.
3. Quantity of water to be carried.
4. The nearest railroad point of delivery.
5. The wages of good common labor per hour.

# INFORMATION REQUIRED WITH INQUIRIES FOR PRICES

Continuous-Stave Pipe for { Municipal Supply Lines  
Irrigation Systems  
Power Plants

Sizes: 10 inches to 14 feet, inside diameter.

1. Indicate above by ( X ), the kind of system you propose to install.
2. Write the size of pipe and the length in feet required under each head in feet as shown below.

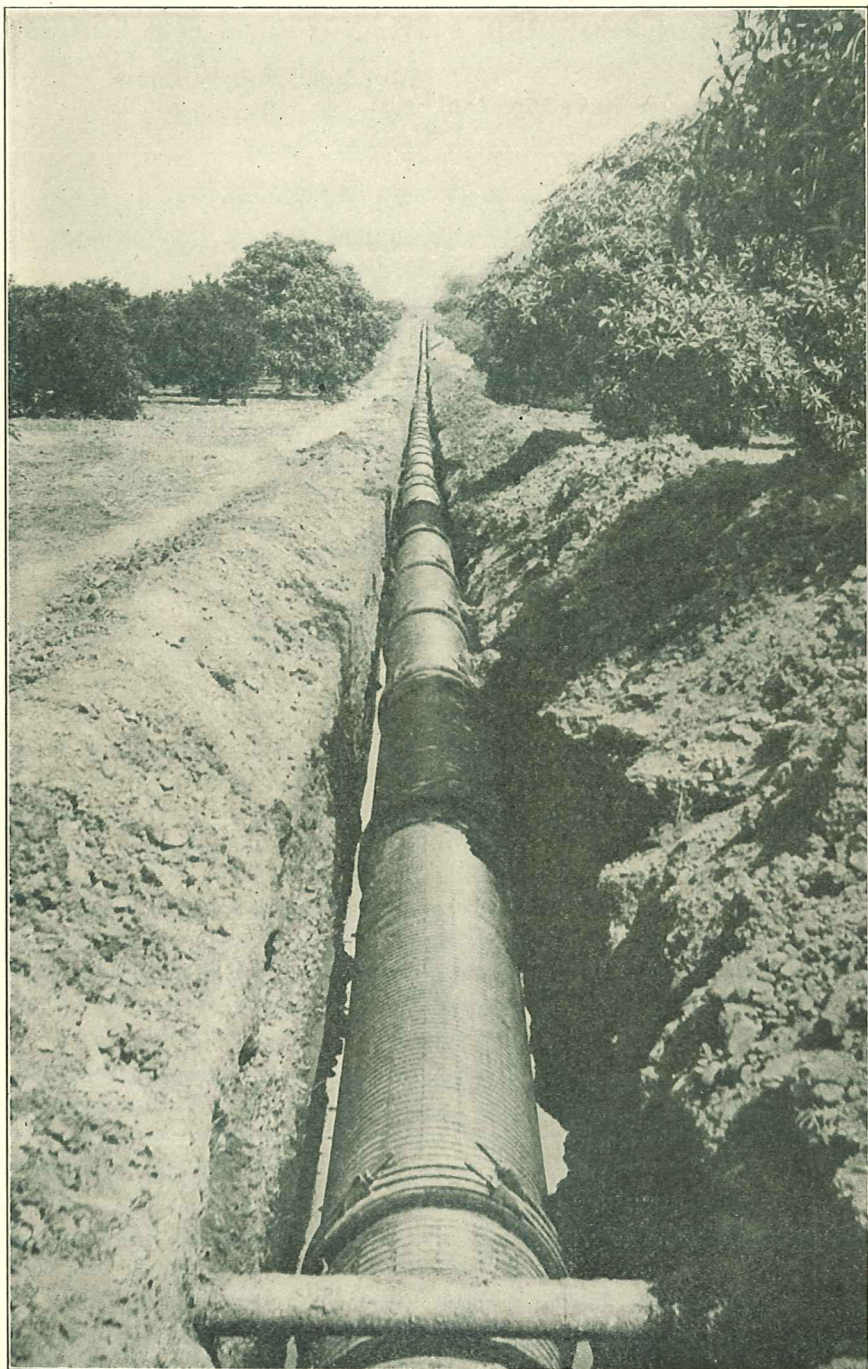
Size of Pipe.....

| HEAD | QUANTITY | HEAD | QUANTITY | HEAD | QUANTITY |
|------|----------|------|----------|------|----------|
| 10   | .....    | 110  | .....    | 210  | .....    |
| 20   | .....    | 120  | .....    | 220  | .....    |
| 30   | .....    | 130  | .....    | 230  | .....    |
| 40   | .....    | 140  | .....    | 240  | .....    |
| 50   | .....    | 150  | .....    | 250  | .....    |
| 60   | .....    | 160  | .....    | 260  | .....    |
| 70   | .....    | 170  | .....    | 270  | .....    |
| 80   | .....    | 180  | .....    | 280  | .....    |
| 90   | .....    | 190  | .....    | 290  | .....    |
| 100  | .....    | 200  | .....    | 300  | .....    |

3. The quantity of water to be delivered.
4. Will the project be a gravity or pumping system?
5. If a pumping or power system, name the type of pump or wheel that you propose to use.
6. If possible, send plans and profiles or sketch, showing pipe location, elevation at intake, discharge points, etc.
7. Give a list of water supply fittings that you require.
8. Name nearest railway station, or if export, nearest seaport.
9. What is wage per hour of good common labor, and is it available near site of installation?
10. When do you plan the commencement and completion of the installation?
11. Do you wish now merely preliminary prices to aid you in making approximate estimates, or do you intend to place your order immediately?

Note.—It is very essential to give as complete information as possible, so our Engineering Department can prepare intelligent estimates and specifications for each project.





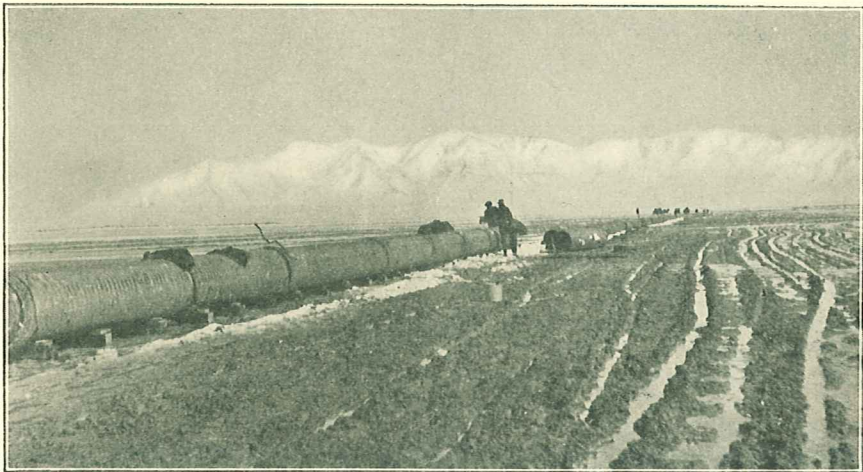
Main Supply Line for the City of Oroville, California. Approximately  $\frac{1}{2}$  mile of 20", 100' head  
Machine-Banded Redwood Pipe furnished Oro Water, Light & Power Company

### MACHINE-BANDED PIPE

Pacific Machine-Banded Pipe was an outgrowth of the old bored pipe, which gave such universal satisfaction that a demand developed for a similar form of pipe capable of resisting higher pressures. This resulted in the manufacture of a bored pipe which was banded with flat steel banding, dipped in asphaltum and provided with inserted joints.

Many installations of this character are being operated successfully after a long and satisfactory life. The City of Olympia, Washington, has in its system many miles of this class of pipe which is still giving very satisfactory service after being in use 35 years.

To obtain a shell absolutely free from defects (difficult in the bored log type) we developed the present form of Machine Banded Pipe, composed of staves accurately milled to radial and



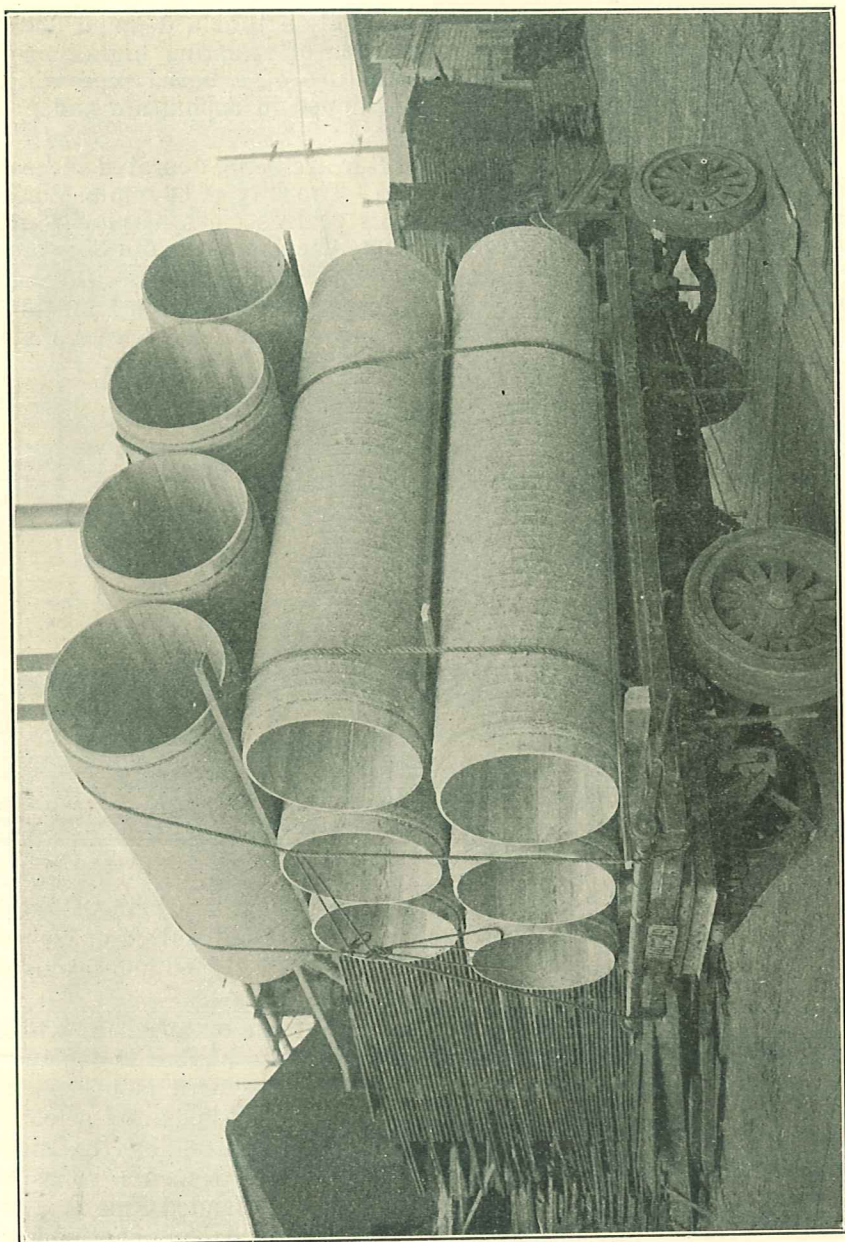
11,000 feet 24" Pacific Machine-Banded Pipe laid on the bed of Great Salt Lake, Utah

circumferential lines, and assembled in sections of varying lengths up to 24 feet. These sections are banded with galvanized or copper wire. The ends are carefully and accurately machined and provided with suitable collars to join the individual sections.

Special stress is laid on the selecting of the materials of which Pacific Machine-Banded Pipe is composed. The lumber is carefully and thoroughly seasoned and inspected. The wire is of special composition, galvanized by the most modern methods and selected with a view toward long life. It is manufactured by the most modern machines, the results of years of improvements, so as to insure mechanical perfection. Pacific Machine-Banded Pipe is additionally protected by means of a high grade asphaltum coating and then rolled in sawdust.

Complete specifications will be found on pages 52-53.





32" Machine-Banded Fir Pipe being transported from cars to point of installation

### SIZE AND PRESSURE

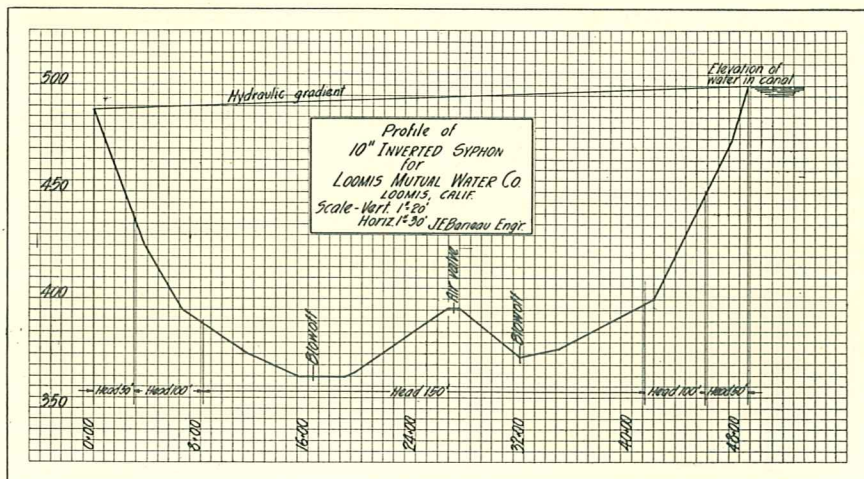
Pacific Machine-Banded Pipe can be furnished in either Redwood or Fir, and in sizes from 2" to 32" inside diameter. Where the diameter is 20" or greater, it would be well for prospective purchasers to investigate Pacific Continuous-Stave Pipe for their proposed installations, carefully considering the relative merits of each class of pipe.

For sizes varying from 20" to 32", there are many conditions which might determine the kind of pipe to use, viz.:

1. Relative cost.
2. The quantity and pressure.
3. The cost of transportation.
4. The time of delivery required. Large sizes Machine-Banded Pipe are very bulky, and for low heads, cars cannot be loaded to minimum carload weights. When the rate is low, this is not material, but when the rates are high, this becomes a considerable part of the initial cost.

Pacific Machine-Banded Pipe is furnished for various pressures up to 400' head. The minimum head of 50' is increased by increments of 50' each to 400'. The thickness of the staves, dimensions of tenons, mortises or collars remains the same for all heads. The change of pressure is accomplished by changing the spacing of the wire, viz., the higher the pressure, the closer the banding.

Where the pressure exceeds 400', a specially designed pipe is required, and we will gladly assist in such design and quote special figures upon receipt of full data.







12" Machine-Banded Pipe laid on curve

### CURVATURE

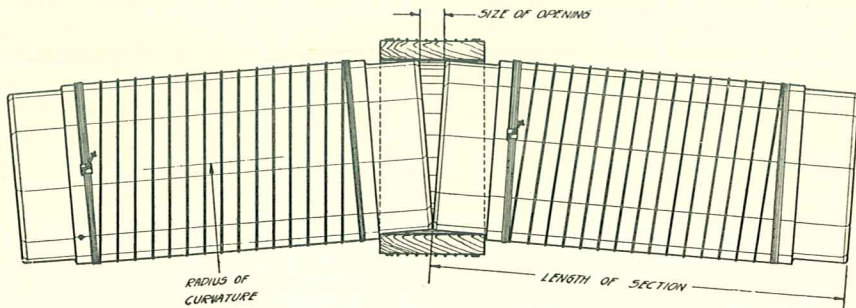
In Machine-Banded Pipe, the curvature is made by breaking each joint slightly as shown on the sketch below. The individual sections of pipe are not bent as in the case of the Continuous - Stave Pipe, and therefore, sharp curves in Machine-Banded Pipe are to be discouraged, and it is recommended that fittings be resorted to where it is necessary to make sharp turns.

The minimum radius of curvature on which Machine-Banded Pipe can be laid, depends largely on the diameter of the pipe, pressures under which the pipe will operate and the lengths of the sections available. Sharp curves can be made in Machine-Banded Pipe for low pressures, and where sharp curves are made under

comparatively high pressures, it is recommended that the pipe be well braced, so that it will not have a tendency to buckle and open joints.

Purchasers of Pacific Machine-Banded Pipe, who contemplate laying this pipe on curves, should carefully read the printed instructions which are sent out with all orders for pipe.

The tables given on the opposite page show the radii of curvature that can be obtained with a given opening and a given length of pipe.



## LENGTH OF PIPE SECTIONS THAT WILL FORM THE PIPE LINE CURVATURE OF GIVEN RADII

| I. D. OF PIPE, INCHES       |  | RADII IN FEET WITH OPENING $\frac{1}{4}$ INCH |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
|-----------------------------|--|-----------------------------------------------|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|
|                             |  | 2"                                            | 3"  | 4"  | 5"  | 6"  | 8"   | 10"  | 12"  | 14"  | 16"  | 18"  | 20"  | 22"  | 24"  | 26"  | 28"  |
| LENGTH OF PIPE SECTION FEET |  | 87                                            | 111 | 138 | 162 | 186 | 234  | 282  | 336  | 384  | 432  | 480  | 528  | 576  | 625  | 672  | 720  |
| 3'                          |  | 116                                           | 148 | 184 | 216 | 248 | 312  | 377  | 449  | 512  | 577  | 640  | 705  | 770  | 832  | 896  | 960  |
| 4'                          |  | 145                                           | 185 | 230 | 270 | 310 | 390  | 470  | 560  | 640  | 720  | 800  | 880  | 960  | 1040 | 1120 | 1200 |
| 5'                          |  | 174                                           | 222 | 276 | 324 | 372 | 468  | 564  | 672  | 768  | 864  | 960  | 1056 | 1152 | 1248 | 1344 | 1440 |
| 6'                          |  | 232                                           | 296 | 368 | 432 | 496 | 624  | 754  | 898  | 1024 | 1154 | 1280 | 1410 | 1540 | 1664 | 1792 | 1920 |
| 8'                          |  | 290                                           | 370 | 460 | 540 | 620 | 780  | 940  | 1120 | 1280 | 1440 | 1600 | 1760 | 1920 | 2080 | 2240 | 2400 |
| 10'                         |  | 348                                           | 444 | 552 | 648 | 744 | 936  | 1128 | 1344 | 1536 | 1728 | 1920 | 2112 | 2304 | 2496 | 2688 | 2880 |
| 12'                         |  | 406                                           | 518 | 644 | 756 | 868 | 1092 | 1316 | 1568 | 1792 | 2016 | 2240 | 2464 | 2688 | 2912 | 3136 | 3360 |
| 14'                         |  | RADII IN FEET WITH OPENING $\frac{1}{2}$ INCH |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| 3'                          |  | 44                                            | 56  | 69  | 81  | 93  | 117  | 141  | 168  | 192  | 216  | 240  | 264  | 288  | 313  | 336  | 360  |
| 4'                          |  | 58                                            | 74  | 92  | 108 | 124 | 156  | 189  | 225  | 256  | 289  | 320  | 353  | 385  | 416  | 448  | 480  |
| 5'                          |  | 73                                            | 93  | 115 | 135 | 155 | 195  | 235  | 280  | 320  | 360  | 400  | 440  | 480  | 520  | 560  | 600  |
| 6'                          |  | 87                                            | 111 | 138 | 162 | 186 | 234  | 282  | 336  | 384  | 432  | 480  | 528  | 576  | 624  | 672  | 720  |
| 8'                          |  | 116                                           | 148 | 184 | 216 | 248 | 312  | 377  | 449  | 512  | 577  | 640  | 705  | 770  | 832  | 896  | 960  |
| 10'                         |  | 145                                           | 185 | 230 | 270 | 310 | 390  | 470  | 560  | 640  | 720  | 800  | 880  | 960  | 1040 | 1120 | 1200 |
| 12'                         |  | 174                                           | 222 | 276 | 324 | 372 | 468  | 564  | 672  | 768  | 864  | 960  | 1056 | 1152 | 1248 | 1344 | 1440 |
| 14'                         |  | 203                                           | 259 | 322 | 378 | 434 | 546  | 683  | 784  | 896  | 1008 | 1120 | 1232 | 1344 | 1456 | 1568 | 1680 |
|                             |  | RADII IN FEET WITH OPENING $\frac{3}{4}$ INCH |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |
| 3'                          |  | 29                                            | 37  | 46  | 54  | 62  | 78   | 94   | 112  | 128  | 144  | 160  | 176  | 192  | 208  | 224  | 240  |
| 4'                          |  | 39                                            | 49  | 61  | 72  | 83  | 104  | 126  | 149  | 170  | 192  | 213  | 235  | 257  | 277  | 299  | 320  |
| 5'                          |  | 48                                            | 62  | 77  | 90  | 103 | 130  | 157  | 187  | 213  | 240  | 266  | 293  | 320  | 346  | 373  | 400  |
| 6'                          |  | 58                                            | 74  | 92  | 108 | 124 | 156  | 188  | 224  | 256  | 288  | 320  | 352  | 384  | 416  | 446  | 480  |
| 8'                          |  | 78                                            | 98  | 123 | 144 | 166 | 208  | 252  | 299  | 341  | 384  | 426  | 470  | 516  | 554  | 598  | 640  |
| 10'                         |  | 96                                            | 124 | 154 | 180 | 206 | 260  | 314  | 374  | 426  | 480  | 532  | 586  | 640  | 692  | 746  | 800  |
| 12'                         |  | 116                                           | 148 | 184 | 216 | 248 | 312  | 376  | 448  | 512  | 576  | 640  | 704  | 770  | 832  | 896  | 960  |
| 14'                         |  | 135                                           | 173 | 215 | 252 | 289 | 364  | 455  | 523  | 597  | 672  | 747  | 821  | 896  | 971  | 1045 | 1120 |

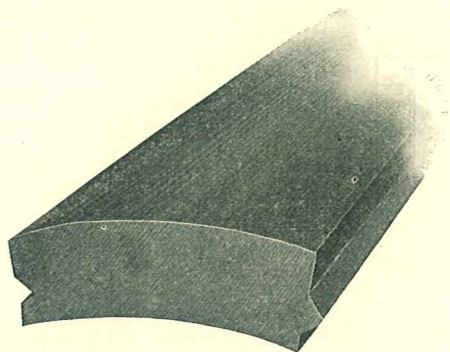
EXAMPLE.—A pipe line survey for an 8" installation shows that at one point a radius of 160 feet will be necessary. Assuming  $\frac{1}{4}$ " as the maximum desirable opening, reference to the table will show that the use of 4-foot lengths will make a radius of 156 feet, 5-foot lengths will make a radius of 195 feet. The use of 4-foot lengths will therefore be necessary.



### GENERAL SPECIFICATIONS FOR PACIFIC MACHINE-BANDED PIPE

**Staves (Redwood).—**The staves shall be milled from clear, thoroughly seasoned Redwood lumber and shall be free from sap, pitch, pitch seams, splits, knots (except small sound knots appearing in one face only), dry rot or any other imperfections that may impair their strength or durability.

The staves shall be milled to the circular outline of the pipe, both inside and outside, and the edges shall be milled to radial lines. One edge shall have a small triangular groove near its center line, and the other edge shall have a tongue or bead of the same shape, making a tight



joint when the pipe is banded. The staves shall dress to the finished thickness shown in table on page 54.

**Staves (Fir).—**The staves shall be milled from clear, straight grained, kiln dried or thoroughly air dried Douglas Fir, and shall be free from checks, dry rot, large or unsound knots. Small sound tight knots and small pitch pockets, not extending through the stave, shall be allowed. Bright sap appearing on the inside of the stave and not extending more than half way through the piece shall be allowed. Edges shall be practically clear and contain no defect that will prevent a water-tight joint when milled.

The staves shall be milled to the circular outline of the pipe, both inside and outside, and the edges shall be milled to radial lines. One edge shall have a small triangular groove near its center line, and the other edge shall have a tongue or bead of the same shape, making a tight joint when the pipe is banded. The staves shall dress to the finished thickness shown in table on page 54.

**Banding.—**The pipe shall be banded with heavily galvanized special pipe winding wire, which shall have a minimum breaking strength of 60,000 pounds and an average breaking strength of approximately 68,000 lbs. per square inch of cross sections with sufficient ductility to enable the wire to stand bending around its own diameter.

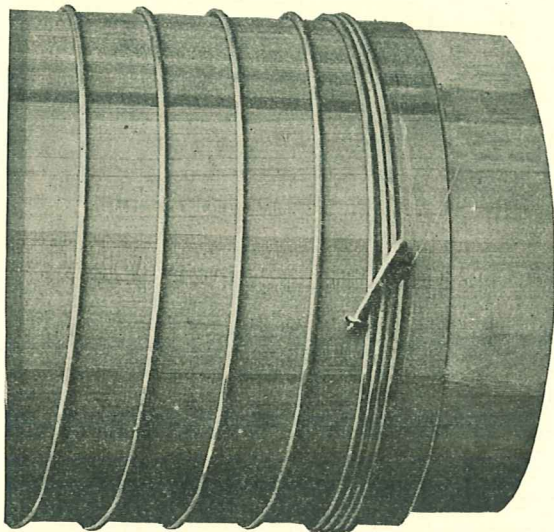
The wire shall be applied under a uniform tension, sufficient to seat it slightly into the fibres of the staves, and shall be spaced so as to have factor of not less than 4, based on maximum breaking strength of 60,000 pounds per square inch.

More detailed specifications for wire and spacing of same will be gladly furnished upon request.

**Couplings.**—See detailed description and illustrations on pages 56-57.

**Coating.**—After banding and heading, both pipe and wood couplings shall be coated on the outside by passing through a bath of Pacific Preservative Dip, and shall then be rolled in sawdust to facilitate handling.

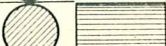
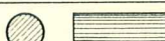
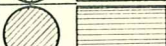
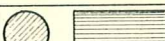
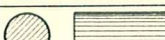
**Manufacture.**—The pipe shall be manufactured by machinery especially designed for the purpose. On both ends the wire shall be secured by a heavy sheradized steel clip, at least three turns passing through the clip before the lugs are hammered down. The ends of the pipe shall be headed smoothly and uniformly, so as to make a driving fit with coupling to be used.



**General.**—The pipe shall be furnished in random lengths up to 24 feet with a sufficient number of short lengths to make all ordinary curves. The head or pressure for which the pipe is banded shall be plainly marked on the inside of the pipe or collar.

Note—Hundreds of miles of Pacific Machine-Banded Wood-Stave Pipe have been furnished built according to our Standard Specifications, and are giving eminent satisfaction. If desired, we will gladly bid on special specifications when presented to us, assuring you that if orders are placed with us that our customary high standard of workmanship will be adhered to.



| Standards for Pacific Machine Banded Wood Pipe |                     |                            |                                                                                   |              |                     |                            |                                                                                   |
|------------------------------------------------|---------------------|----------------------------|-----------------------------------------------------------------------------------|--------------|---------------------|----------------------------|-----------------------------------------------------------------------------------|
| Size of Pipe                                   | Thick-ness of Shell | Size of Wire W. & M. Gauge | Full Sizes of Pipe Winding Wire                                                   | Size of Pipe | Thick-ness of Shell | Size of Wire W. & M. Gauge | Full Sizes of Pipe Winding Wire                                                   |
| 2"                                             | $\frac{7}{8}$ "     | 8                          |  | 16"          | $1\frac{1}{4}$ "    | 2                          |  |
| 3"                                             | 1"                  | 8                          |  | 18"          | $1\frac{1}{4}$ "    | 2                          |  |
| 4"                                             | $1\frac{1}{16}$ "   | 8                          |  | 20"          | $1\frac{5}{16}$ "   | 2                          |  |
| 5"                                             | $1\frac{1}{16}$ "   | 8                          |  | 22"          | $1\frac{5}{16}$ "   | 1                          |  |
| 6"                                             | $1\frac{1}{16}$ "   | 6                          |  | 24"          | $1\frac{5}{16}$ "   | 1                          |  |
| 8"                                             | $1\frac{1}{8}$ "    | 6                          |  | 26"          | $1\frac{5}{16}$ "   | 1                          |  |
| 10"                                            | $1\frac{1}{8}$ "    | 6                          |  | 28"          | $1\frac{5}{16}$ "   | 1                          |  |
| 12"                                            | $1\frac{3}{16}$ "   | 4                          |  | 30"          | $1\frac{5}{16}$ "   | 1                          |  |
| 14"                                            | $1\frac{3}{16}$ "   | 4                          |  | 32"          | $1\frac{5}{16}$ "   | 1                          |  |

The purchaser of Machine-Banded Wood Pipe should carefully consider the specifications according to which the pipe is to be built before placing his order. The quality and thickness of the staves, the diameter and spacing of the wire and the character of the coating should be thoroughly investigated.

Our standards are the result of years of experiments, manufacture and careful investigations in the field. Our greatly diversified manufacturing interests enables us to select lumber best suited for pipe construction, and the largest manufactures of galvanized steel wire advise that there is no galvanized steel wire of analysis different from ours having the property of better resisting corrosion than Pacific Pipe Winding Wire. Our large modern plant and machinery assures you of mechanical perfection.

Our policy has been to produce the very best Wood-Stave Pipe on the market, and not to see how cheaply a wood-stave pipe can be manufactured. By this policy we have built up a large business, and by its continuance we expect, not only to maintain, but to largely extend the use of Pacific Wood-Stave Pipe. Our successful installations of the past warrant our optimism for the future.

## COATING

Our standard specifications call for coating the exterior surface of Pacific Machine-Banded Wood-Stave Pipe with an asphaltic preservative. We have adopted this practice for the same reason that we galvanize the banding, use thick staves and heavy wire—because it makes better pipe.

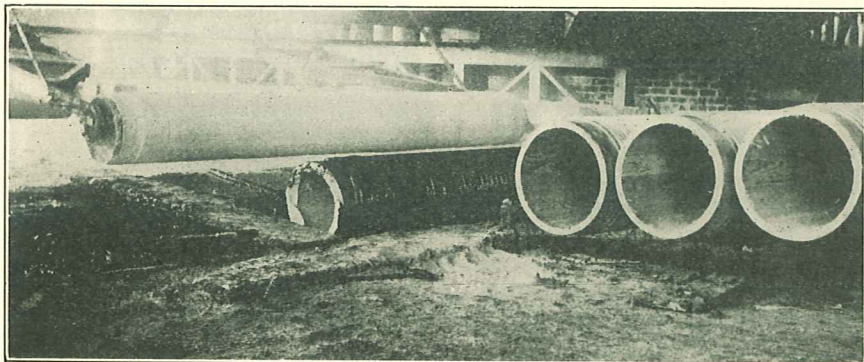
This coating is a pure asphaltic bitumen of a tough rubbery character and high melting point, homogeneous and uniform, possessing good adhesive qualities and entire freedom from decomposed products. It is not readily affected by changes in temperature, and does not run or bleed in hot, nor chip in cold weather.

The outer shell of the pipe is immersed in this hot bath till a thick coating has been applied and all the angles of contact between the wood and wire thoroughly filled. This seals up the wire from possible contact with moisture and alkalies by encasing it in a flexible jacket of adhesive mineral product, absolutely impervious to air or water.

While its coating is still in a plastic state, the pipe is revolved by patented automatic machines and dry wood dust and fibre thoroughly embedded in the surface as crushed rock is rolled into asphaltic pavement. This gives additional mechanical protection and makes the completed pipe clean and easy to handle. The wire is thus protected against corrosion by two of the best metal preservatives known to practical industry.

Some engineers attach so much importance to this coating that they insist that the wire itself shall pass through a hot bath of it before being wound on the shell of the pipe. Our factory mechanism is so arranged that this can readily be done by changing the lead of the wire to pass through a special hot dip tank.

Where cost is the controlling factor, some saving in price can be made by buying uncoated pipe. We can, of course, easily omit the coating process or dip the wire alone, but so much better results are obtained by coating the entire outer shell that we always recommend that practice.





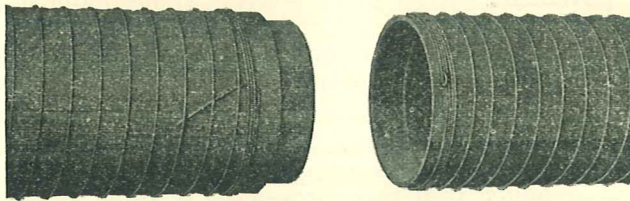
### COUPLINGS

Various kinds of couplings or joints are used in connecting the sections of Pacific Machine-Banded Pipe. When compared with each other, these various types have certain advantages, and the designer of a pipe line should carefully consider such advantages when applied to his particular installation.

For example, the inserted joint is the cheapest form of joint, and is particularly well adapted for low gravity heads. The Pacific Reinforced Inserted Joint is used mostly on the larger sizes of pipe under low head. This type of joint insures a thorough saturation even under the very lowest pressures.

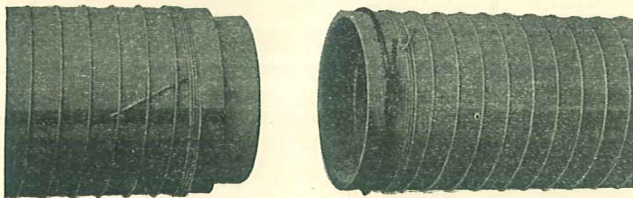
The wood coupling is the most universally used. Machine-banded couplings are used for sizes up to and including 12" pipe. Individually banded couplings are used for sizes above 12". Even though very much cheaper in first cost, it is recommended that the machine-banded coupling should not be used for sizes above 16".

Cast iron couplings are the highest in cost and are to be recommended for pipe subjected to high pressure, and when there is considerable water hammer. This type of joint is recommended for municipal and fire distributing systems.



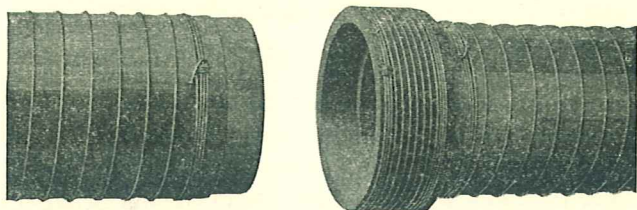
Pacific Inserted Joint

This joint is made by boring a mortise smoothly to a uniform diameter in one end, and the other turned down smoothly to a uniform tenon, but of proper size to make a driving fit with mortise end of any other section. The mortise end is reinforced by an extra turn of wire. No coating on the inside is required for a water tight joint.



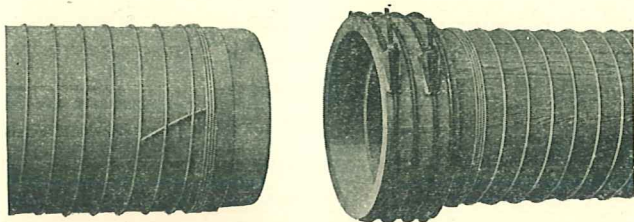
Pacific Reinforced Inserted Joint

This joint is constructed in the same general manner as the inserted joint described above. The mortise end is reinforced by one or more individual bands, depending on the sizes and pressure.



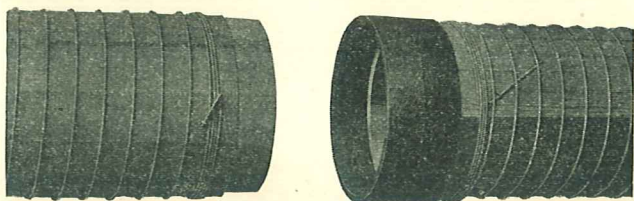
Pacific Machine-Banded Wood Coupling

Pacific Machine-Banded Wood Couplings are made of the same quality of material as the pipe and are coated in the same manner. They are banded with the same size of wire, spaced approximately one-half the spacing on the body of the pipe to give additional strength. The couplings are 6" or 8" long, and are always made of Redwood unless otherwise specified.



Pacific Individually Banded Wood Coupling

Individually banded wood couplings are made of the same quality of material as the pipe and coated in the same manner. They are banded with individual bands (not less than three)  $\frac{3}{8}$ " to  $\frac{1}{2}$ " in diameter, varying according to size of the pipe. An additional factor of safety is provided in the banding to insure ample strength. These collars are 8" long.



Pacific Cast Iron Coupling

Cast iron couplings are made of a good quality of soft gray iron, free from flaws and defects and of ample strength to resist pressures for which pipe is banded. The couplings are painted or dipped in an asphaltum dip before shipment is made from the factory. These couplings are always shipped loose.

Note.—All Pacific Wood Collars are reamed by specially designed high speed machine, insuring an exact uniform diameter and a perfect fit with the tenon.



## EXPORT

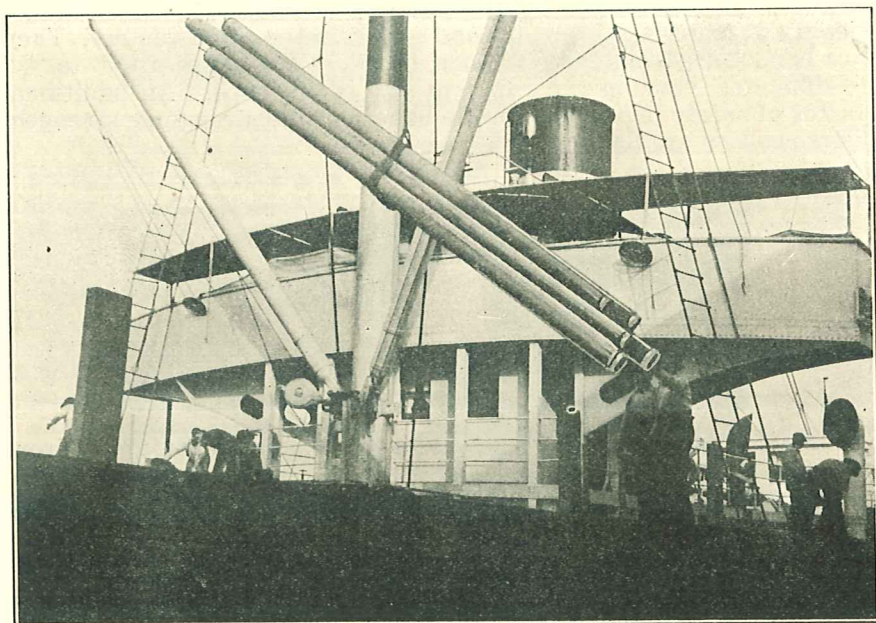
Many miles of Pacific Machine-Banded Pipe are in successful operation in foreign countries throughout the world. Satisfied Pacific customers can be found in China, Japan, Philippine Islands, Korea, Mexico, the countries of Central and South America, South Africa, Dutch East Indies, Hawaiian Islands, Cuba, Australia, Alaska and the Dominion of Canada.

Our plant and yards being located on deep water in San Francisco Bay, places us in a position to offer prompt and efficient service to our foreign friends.

We recommend banding and plugging the pipe as illustrated, the cost being small, but insuring that the pipe will reach destination in good and serviceable condition. The smaller sizes may be nested in the larger in multiples of 4 inches, viz.: 4" in 8", 6" in 10", etc., making a considerable saving in freight.

Our clerical force is well versed with the custom requirements of various foreign countries, and our traffic department will see that the best rates and early shipments are secured.

Ask some of our foreign friends how they like Pacific Service.

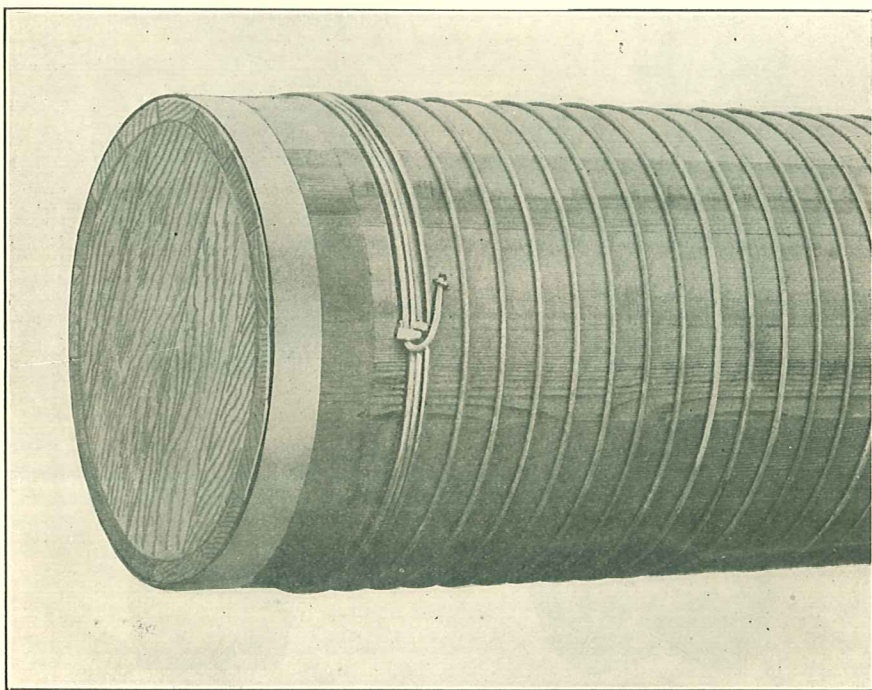


Portion of 100 miles of Pacific Machine-Banded Pipe being loaded for shipment to Chile

### CUBIC MEASUREMENT OF MACHINE-BANDED WOOD STAVE PIPE, INCLUDING COLLARS, FOR STEAMER SHIPMENT

| SIZE OF PIPE | CUBIC FEET<br>PER FOOT<br>OF PIPE | SIZE OF PIPE | CUBIC FEET<br>PER FOOT<br>OF PIPE |
|--------------|-----------------------------------|--------------|-----------------------------------|
| 2"           | 0.14                              | 12"          | 1.67                              |
| 3"           | .23                               | 14"          | 2.15                              |
| 4"           | .33                               | 16"          | 2.75                              |
| 5"           | .44                               | 18"          | 3.36                              |
| 6"           | .62                               | 20"          | 4.06                              |
| 8"           | .87                               | 22"          | 4.80                              |
| 10"          | 1.22                              | 24"          | 5.57                              |

The above table is based on pipe being shipped with collars detached, both ends banded and plugged as illustrated below. The collars are crated and strapped. The measurement given in above table includes the collars.



20" Pipe banded and plugged for export shipment



### FITTINGS

Pacific Fittings are cast from the best quality of soft gray iron, free from flaws and defects, and designed for a working pressure of 175 pounds per square inch with an ample factor of safety. These fittings receive a protective coat of asphalt paint before being shipped from the factory.

A complete set of the very best type of patterns is maintained at our foundry, so constructed as to be interchangeable, making it possible to cast fittings having outlets to fit both wood and any other class of pipe. It is impossible to illustrate all fittings used with Pacific Machine-Banded Pipe, but the following are some of the more commonly used fittings.

If interested in any special fittings, write us, describing same, or send us a rough sketch and complete information, and prices will be furnished.

Pacific Fittings are ordinarily furnished with plain bells. Lead lined bells can be furnished if desired, this, however, being a needless expense.

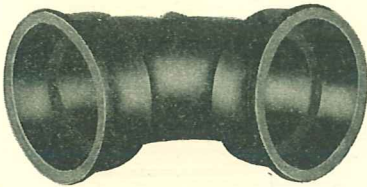


Figure 1  
90° Elbow

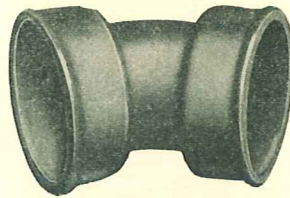


Figure 2  
45° Elbow

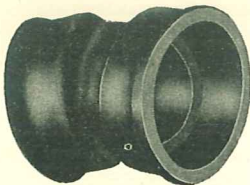


Figure 3  
22½° Elbow

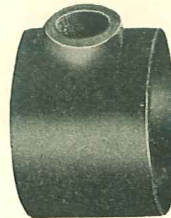


Figure 4  
Cast Iron Tapped Collar

## FITTINGS

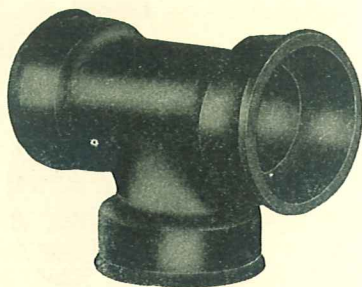


Figure 5  
Tee

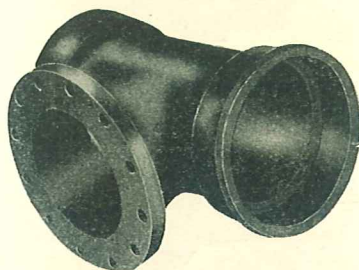


Figure 6  
Tee with Flanged Branch

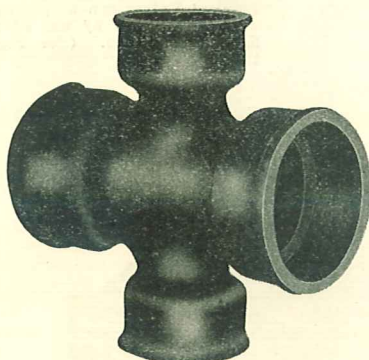


Figure 7  
Cross

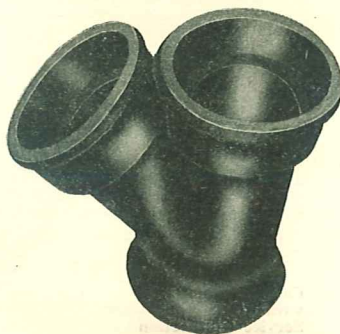


Figure 8  
Wye

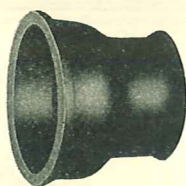


Figure 9  
Reducer



Figure 10  
Flanged Coupling

We are prepared to furnish elbows of other degrees, those given are standard.

All fittings with flanged outlets are furnished, faced and drilled to American standard, unless otherwise specified. If threaded outlets are desired, the kind of thread (standard or casing) should be given. Tapped collars can be provided with outlets up to and including 2".





Figure 11  
Brass Tapping Nipple

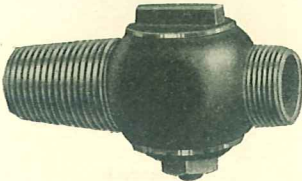


Figure 12  
Corporation Cock



Figure 13

Iron Body, Brass Mounted, Hub End Gate Valve, guaranteed for 175 lbs. working water pressure. Flanged Valves can be placed in wood-stave lines by use of two flanged couplings. (See Figure 10)



Figure 14  
Corporation Cock  
with Goose-Neck  
Service Connection

PRICES UPON APPLICATION

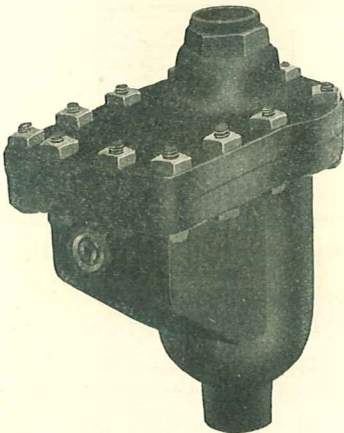


Figure 17  
McCracken Air Valve

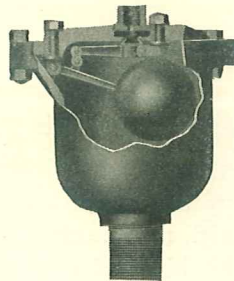


Figure 16  
Crispin Air Valve

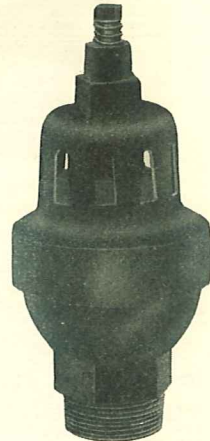


Figure 18  
Brooks Air Valve

## FITTINGS

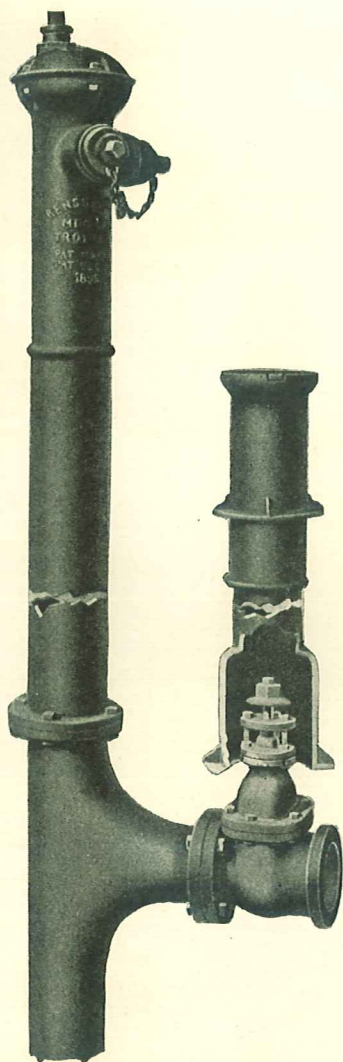


Figure 19  
Fire Hydrant Valve and  
Valve Box

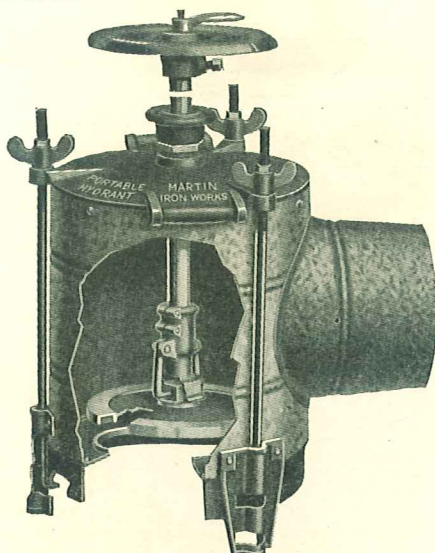


Figure 20

The Martin Portable Hydrant. Can be quickly attached to Martin Valve Type Q shown below. Can be turned in any direction and the flow of water can be controlled.

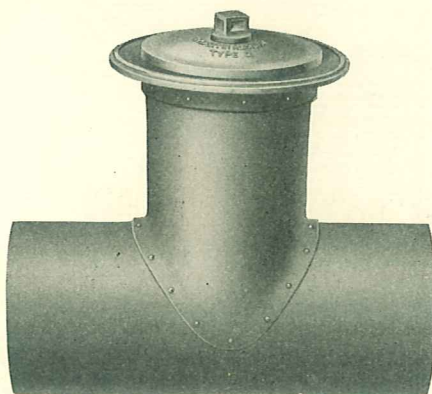
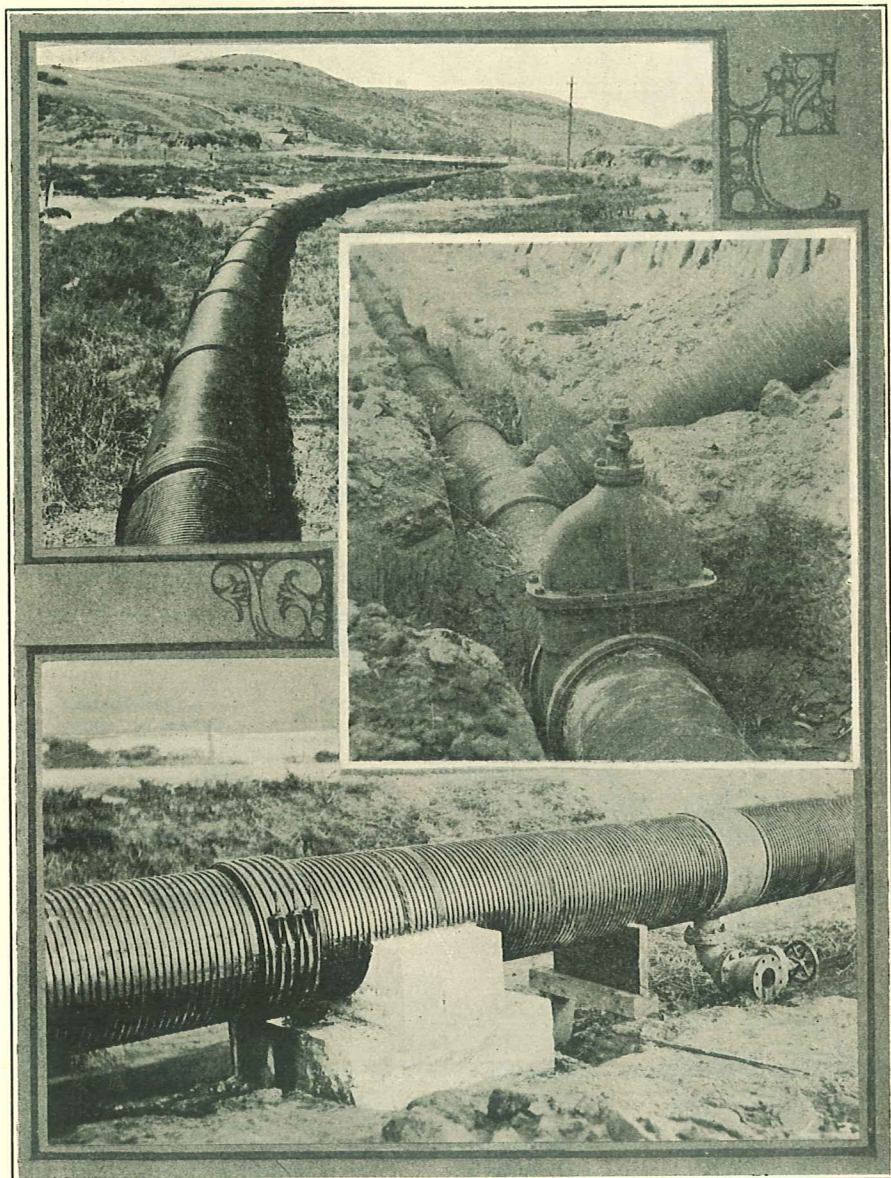


Figure 21

The Martin Alfalfa Valve, attached to a steel tee, can be inserted in the wooden pipeline at any point.

Prices upon application.





18" Machine-Banded Redwood Stave Line carrying water to the City of San Diego, California.  
Note the fittings

## INFORMATION REQUIRED WITH INQUIRIES FOR MACHINE-BANDED WOOD STAVE PIPE

Machine-Banded Stave Pipe for { Municipal Water Systems  
Irrigation Systems  
Power Plants

Sizes: 2 inches to 32 inches, inside diameter.

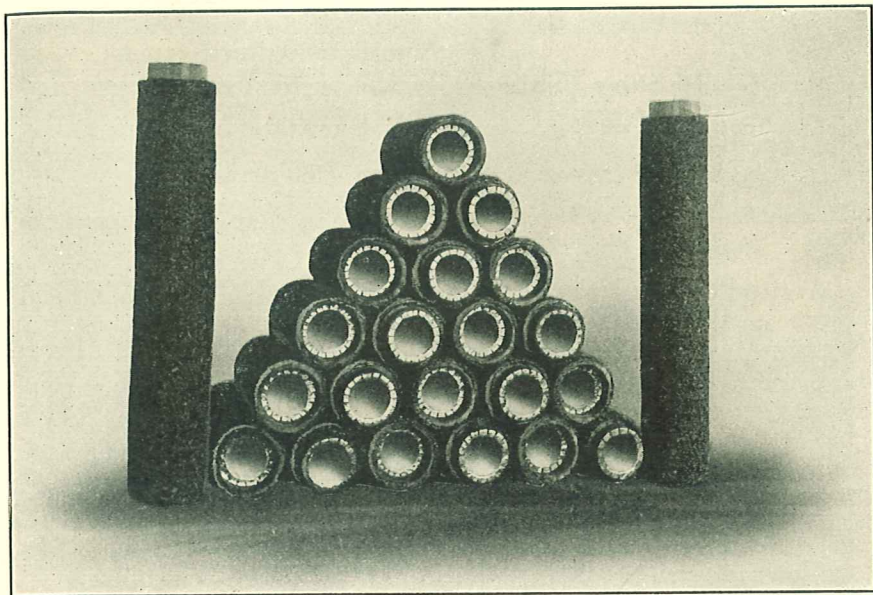
1. Indicate above by ( X ), the kind of system you propose to install.
2. Write the size of pipe and the length required under each head as shown below.

| HEAD    | SIZE..... | SIZE..... | SIZE..... |
|---------|-----------|-----------|-----------|
|         | LENGTH    | LENGTH    | LENGTH    |
| 50 ft.  | .....ft.  | .....ft.  | .....ft.  |
| 100 ft. | .....ft.  | .....ft.  | .....ft.  |
| 150 ft. | .....ft.  | .....ft.  | .....ft.  |
| 200 ft. | .....ft.  | .....ft.  | .....ft.  |
| 250 ft. | .....ft.  | .....ft.  | .....ft.  |
| 300 ft. | .....ft.  | .....ft.  | .....ft.  |
| 350 ft. | .....ft.  | .....ft.  | .....ft.  |
| 400 ft. | .....ft.  | .....ft.  | .....ft.  |

3. The quantity of water to be delivered through each size.
4. Will the project be a gravity or pumping system or a combination of both?
5. If a pumping system, name type of pump that you propose to use.
6. If possible, send plans and profiles, or sketch, showing pipe location, elevation at intake, discharge points, etc.
7. Give a list of water supply fittings that you require.
8. Name railway station at which freight is to be delivered.
9. When do you plan the commencement and completion of the installation?
10. Do you wish now merely preliminary prices to aid you in making approximate estimates or do you intend to place your order immediately?



## PACIFIC STEAM PIPE CASING



Pacific Steam Pipe Casing is composed of staves milled from selected sound Redwood or Fir lumber (customer's option), free from sap, dry rot and large or unsound knots. This lumber is thoroughly kiln dried before being run into staves so as to insure its not shrinking after being laid in the ground. It is then milled into staves, dressed to inside and outside radii with radial edges. The edges are provided with a tongue and groove.

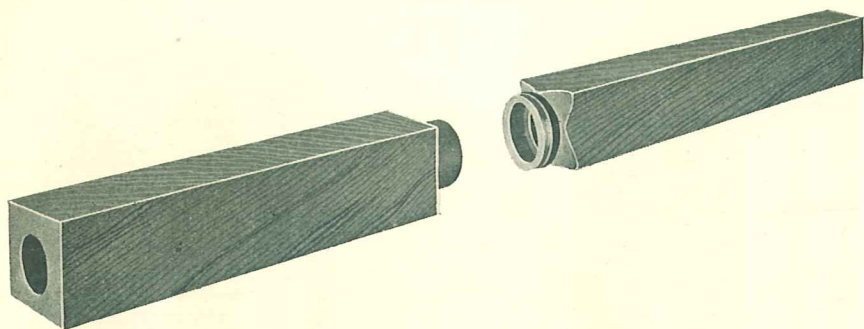
The staves are banded with No. 6 or No. 4 galvanized pipe winding wire, the gauge depending on the size of the casing. A 4" mortise is cut on one end and the other end is provided with a tenon to accurately fit the mortise.

The outside surface receives a heavy coating of Pacific Preservative Asphalt Dip, and is then rolled in sawdust. The inside is lined with A A A A charcoal tin and a layer of asbestos between the staves and tin lining. The casing is usually furnished in random lengths up to 10 feet, with an average length of about 7 feet. Unlined casing can be furnished if desired.

For the insulation of steam or hot water lines, Pacific Steam Casing has no peer. The same high quality of materials and rigid care in its manufacture that is given Pacific Wood-Stave Pipe is maintained.

We are in position to give orders immediate attention, and a large stock of raw materials is always on hand, assuring prompt shipment.

## PACIFIC BORED PIPE



Manufactured of clear, well seasoned Redwood or Fir lumber, in any desired length up to 12 feet, and in any internal diameter from  $1\frac{1}{2}$ " to 6". One end is provided with a carefully machined mortise, and the other end with a tenon of proper size to make a tight fit with the mortise. The mortise end can be furnished with or without reinforcing bands. These bands may be made of either steel or copper.

Prices for Ells, Tees, Crosses, Wyes and Valves made entirely of wood will be furnished upon application.

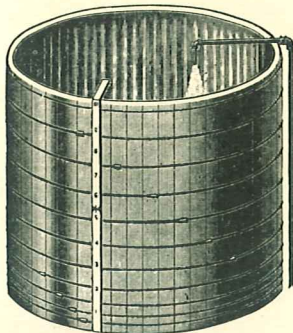
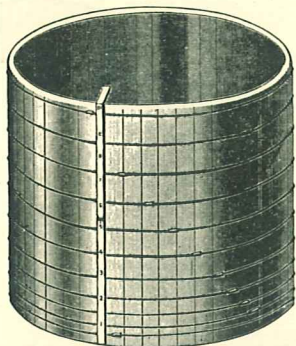
| SIZE OF LUMBER | SIZE OF BORE IN INCHES   | PRICE PER FOOT | WEIGHT PER FOOT | COST COPPER REINFORCING BANDS |
|----------------|--------------------------|----------------|-----------------|-------------------------------|
| 4" x 4"        | $1\frac{1}{2}$ ", 2"     | \$0.31         | 3 lbs.          | \$0.04                        |
| 6" x 6"        | 2", $2\frac{1}{2}$ ", 3" | .56            | 7 lbs.          | .07                           |
| 8" x 8"        | 4", 5"                   | .94            | 14 lbs.         | .09                           |
| 10" x 10"      | 5", 6"                   | 1.37           | 27 lbs.         | .12                           |

Tanneries, vinegar and pickling plants, mining companies, and other industries using corrosive or aciduous solutions prohibiting the use of metal pipe, will find this class of pipe very serviceable for conveying same. Unless otherwise specified, a steel band is used to reinforce the mortise, and the copper band is only furnished upon request.

Pacific Bored Pipe is made for nominal pressures only. Where high pressure pipe is required, our Standard Machine-Banded Pipe with copper banding is recommended, and special estimates will be furnished upon receipt of complete details.



# Pacific Redwood Tanks



## Plain and Patent Non-Shrinking Water Tanks REDWOOD

Fitted with Round, Soft Steel Hoops and Straight Pull Lugs

### 2" STAVES AND BOTTOM

| CAPACITY IN<br>GALLONS<br>NOMINAL | DIAMETER<br>FT. IN. | HEIGHT<br>FEET | APPROX.<br>SHIPPING<br>WEIGHT<br>LBS. | LIST<br>PRICE | CAPACITY IN<br>GALLONS<br>NOMINAL | DIAMETER<br>FT. IN. | HEIGHT<br>FEET | APPROX.<br>SHIPPING<br>WEIGHT<br>LBS. | LIST<br>PRICE |
|-----------------------------------|---------------------|----------------|---------------------------------------|---------------|-----------------------------------|---------------------|----------------|---------------------------------------|---------------|
| 150                               | 3                   | 4              | 243                                   | \$19.00       | 3,000                             | 9                   | 7              | 1,270                                 | \$92.00       |
| 285                               | 4                   | 4              | 343                                   | 23.00         | 4,000                             | 10                  | 8              | 1,555                                 | 125.00        |
| 369                               | 4                   | 5              | 412                                   | 30.00         | 4,000                             | 9                   | 9              | 1,580                                 | 135.00        |
| 500                               | 5                   | 4              | 425                                   | 32.00         | 5,000                             | 11                  | 8              | 1,745                                 | 145.00        |
| 750                               | 5 7                 | 5              | 580                                   | 41.00         | 5,000                             | 10                  | 9              | 1,790                                 | 156.00        |
| 1,000                             | 6 6                 | 5              | 655                                   | 49.00         | 6,000                             | 12                  | 8              | 2,010                                 | 160.00        |
| 1,000                             | 6                   | 6              | 655                                   | 49.00         | 7,000                             | 12                  | 9              | 2,160                                 | 190.00        |
| 1,500                             | 7                   | 6              | 830                                   | 60.00         | 8,000                             | 12                  | 10             | 2,375                                 | 210.00        |
| 2,000                             | 8                   | 6              | 975                                   | 70.00         | 10,000                            | 13 8                | 10             | 2,770                                 | 240.00        |
| 2,500                             | 8                   | 7              | 1,145                                 | 81.00         |                                   |                     |                |                                       |               |

### 3" STAVES AND BOTTOM

| CAPACITY IN<br>GALLONS<br>NOMINAL | DIAMETER<br>FT. IN. | HEIGHT<br>FEET | APPROX.<br>SHIPPING<br>WEIGHT<br>LBS. | LIST<br>PRICE | CAPACITY IN<br>GALLONS<br>NOMINAL | DIAMETER<br>FT. IN. | HEIGHT<br>FEET | APPROX.<br>SHIPPING<br>WEIGHT<br>LBS. | LIST<br>PRICE |
|-----------------------------------|---------------------|----------------|---------------------------------------|---------------|-----------------------------------|---------------------|----------------|---------------------------------------|---------------|
| 10,000                            | 14                  | 10             | 4,700                                 | 330.00        | 50,000                            | 24                  | 16             | 13,400                                | \$1,000.00    |
| 12,000                            | 14                  | 12             | 5,400                                 | 375.00        | 60,000                            | 26 3                | 16             | 15,000                                | 1,140.00      |
| 15,000                            | 15 6                | 12             | 6,080                                 | 435.00        | 70,000                            | 28 4                | 16             | 16,700                                | 1,250.00      |
| 20,000                            | 18                  | 12             | 7,400                                 | 525.00        | 80,000                            | 30 3                | 16             | 18,000                                | 1,360.00      |
| 25,000                            | 18 4                | 14             | 8,510                                 | 620.00        | 90,000                            | 30                  | 18             | 19,600                                | 1,490.00      |
| 30,000                            | 20                  | 14             | 9,600                                 | 710.00        | 100,000                           | 30                  | 20             | 21,100                                | 1,630.00      |
| 40,000                            | 23                  | 14             | 11,300                                | 830.00        |                                   |                     |                |                                       |               |

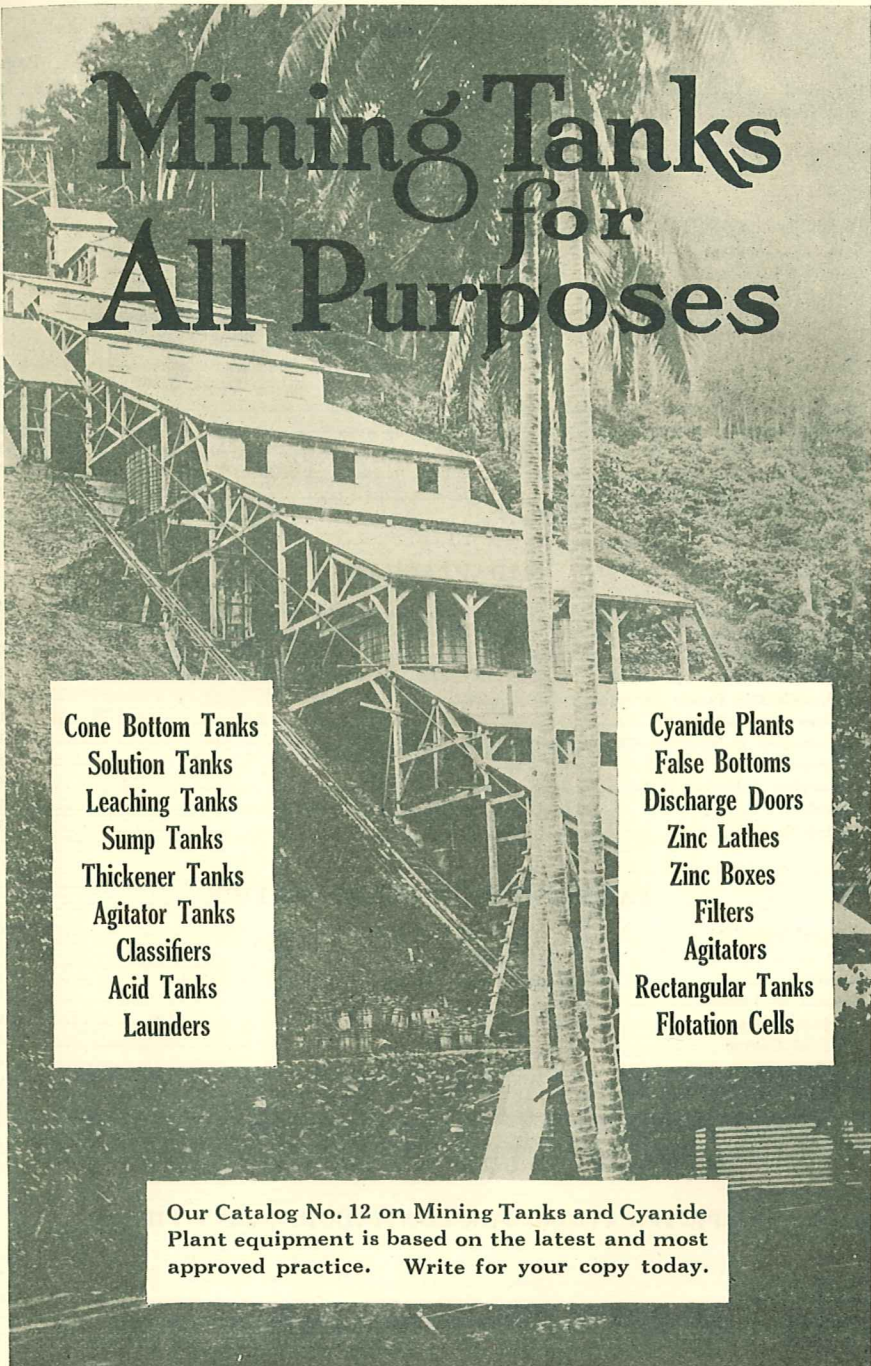
All measurements of diameters and heights are outside measure.

Prices are for tanks **KNOCKED DOWN**, ready to set up, including water register, but do not include towers, covers or foundations.

Write us stating size of tank wanted and we will quote net price.

We furnish and erect Wood and Steel Towers to support these tanks for Domestic, Municipal, and Industrial purposes, and maintain a staff of engineers who have made this work their specialty. It is economical in the end to employ this expert service, as a first class job is assured when finished.

We will supply you with our catalog giving a full description of these items.



# Mining Tanks for All Purposes

Cone Bottom Tanks  
Solution Tanks  
Leaching Tanks  
Sump Tanks  
Thickener Tanks  
Agitator Tanks  
Classifiers  
Acid Tanks  
Launders

Cyanide Plants  
False Bottoms  
Discharge Doors  
Zinc Lathes  
Zinc Boxes  
Filters  
Agitators  
Rectangular Tanks  
Flotation Cells

Our Catalog No. 12 on Mining Tanks and Cyanide Plant equipment is based on the latest and most approved practice. Write for your copy today.



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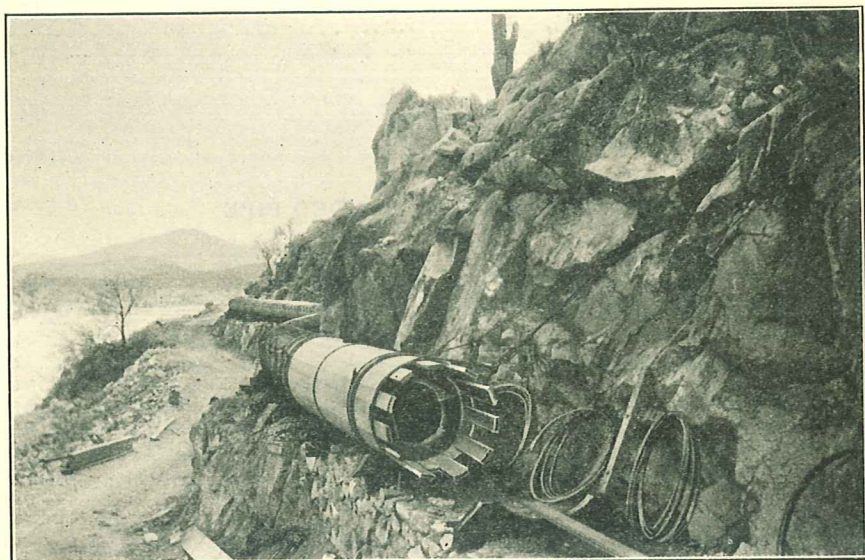
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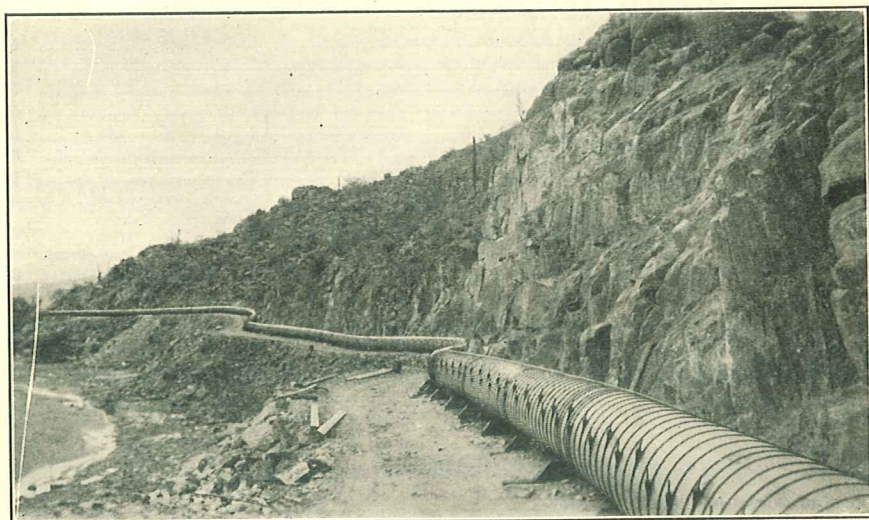
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A Rock Cut Along the Rio Verdi



36" Continuous Redwood-Stave Pipe—Main supply line for City of Phoenix, Arizona

